THE FOUNDRY

Volume 64 Number 12

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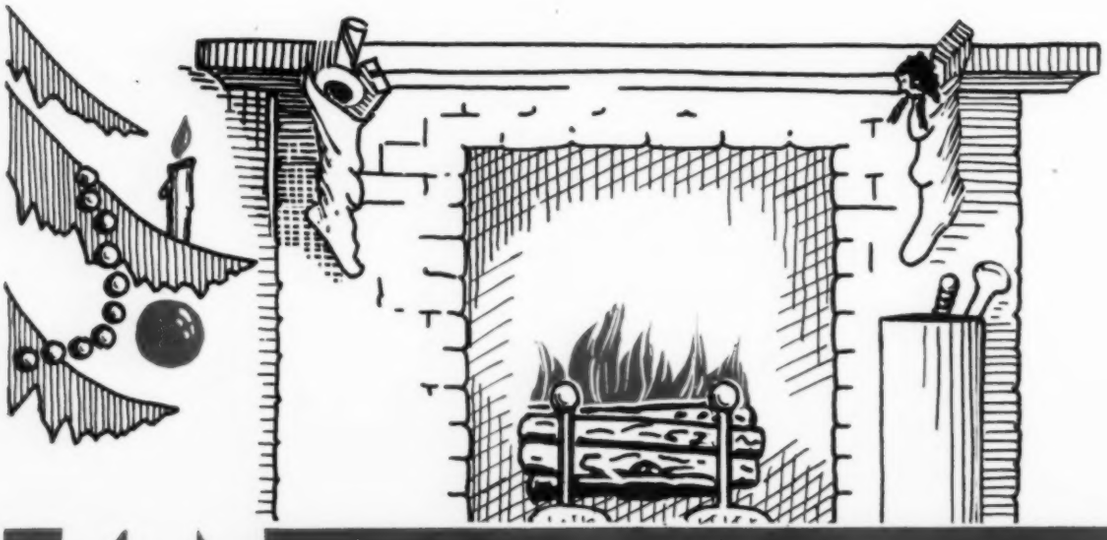
Merry Christmas and

We want to express our heartfelt gratitude to the foundrymen of America whose loyal friendship and valued patronage have made the year of 1936 one of the brightest in our history.



THE WERNER G.

A Happy New Year

Because we have exceeded all previous records in volume shipped and because future schedules are the heaviest in history, we know that the Foundry Industry has come into its own again and we are happy with you. Welcome 1937.

SMITH COMPANY

The Night Before Christmas In the Foundry

'Twas the night before Christmas when all through the shop
Not a creature was stirring, not even a cop,
When an old grain of sand awoke with a start
And blurted this out from the depths of his heart:
"I'm burdened with sorrow, I haven't done right;
My face is all blackened, I'm burned and a sight!
That smooth coat of clay I had at the pit
Is burned on a casting and now I'm not fit.
One day I'm too wet and the next day too dry—
If there's a Santa Claus, please hear my cry!
Our boss is no Scrooge, and if he but knew,
He'd buy us sand grains a SIMPSON or two,
To coat us with bond and temper us right
And improve the condition that we're in tonight.
We then could make castings more perfect and clean,
And the boss sure would gain from a SIMPSON machine."

The boss rolled and tossed as he lay in his bed,
As this dream of his foundry whirled through his head.
He knew competition next year would be keen;
To reduce sand and labor, he also must scheme.
He thought of his dream and decided right quick
A new SIMPSON MIXER would sure do the trick.
He thought of the waste sand that he could reclaim
By the use of clay bond that had sprung into fame.
So he wired his order—don't you think he did right?
A Merry Xmas to all, and to all a Good-night!

NATIONAL ENGINEERING COMPANY
MACHINERY HALL BUILDING *549 W. WASHINGTON BLVD.*
CHICAGO, ILL., U. S. A.
MANUFACTURERS AND SELLING AGENTS FOR CONTINENTAL EUROPEAN COUNTRIES:—THE GEORGE FISCHER STEEL & IRON WORKS, SCHAFFHAUSEN, SWITZERLAND.
FOR GREAT BRITAIN:—AUGUST'S LTD., HALIFAX, ENGLAND

SMITH OF ROCKFORD'S "L-O" CORE OIL USED IN MAKING AUTO BODY DIES

FURTHER PROOF OF THE ADAPTABILITY OF "L-O" CORE OIL TO ALL TYPES OF FOUNDRIES

Dry sand moulds are used for casting automobile body dies, as shown in the two photographs at the right and below.

1937 production is under way! Thousands of car bodies will be formed from dies made with the help of "L-O" Core Oil.

THE STUART FOUNDRY COMPANY . . . manufacturers of body dies and machinery castings for the automotive industry . . . have used Smith of Rockford's "L-O" Core Oil for the past nine years. They have proved it to be of high quality, strong, reliable, and uniform in every respect.

CORRECTLY COMPOUNDED BY OUR OWN **THERMO-TEMPERING** PROCESS

SMITH OIL & REFINING CO.

"SMITH of ROCKFORD"

ROCKFORD • ILLINOIS

Stocks Carried at BIRMINGHAM • CHICAGO • CINCINNATI • DAVENPORT • DETROIT • MILWAUKEE • MINNEAPOLIS • ST. LOUIS

Stoney Knockout Machines

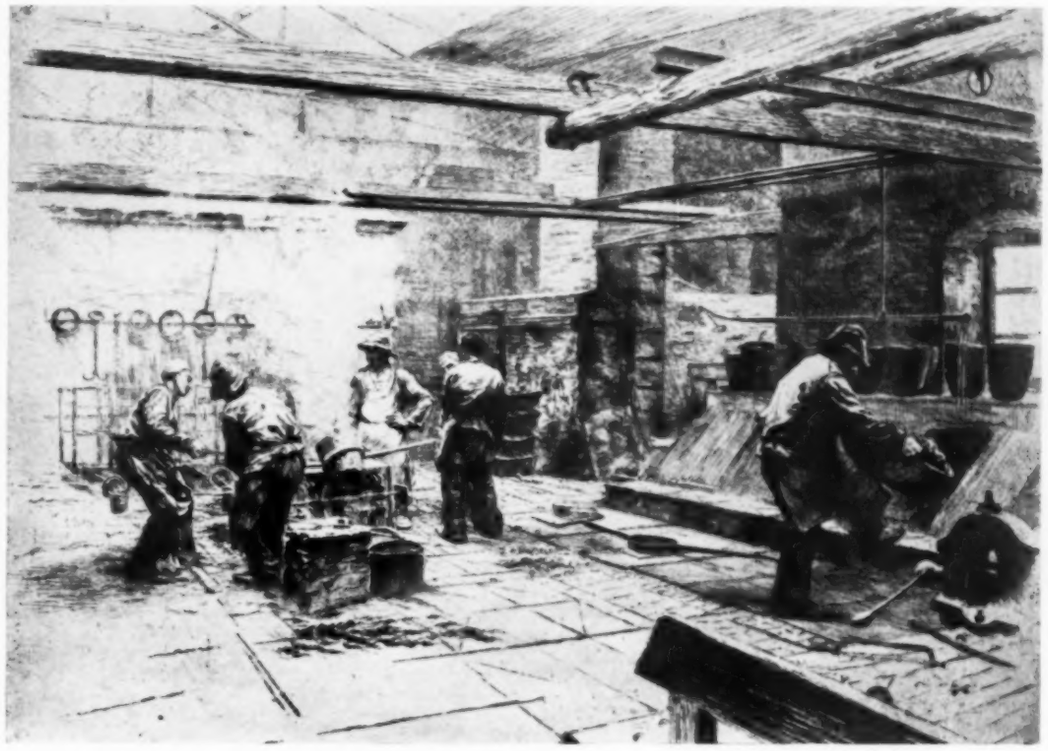
Medium Size Machines removing cores from a Transmission Case in a large tractor plant in 10 seconds.

Built In Sizes And Types To Suit
All Requirements

The Stoney

Foundry Engineering & Equipment Co.

5321 St. Clair Avenue Cleveland, Ohio



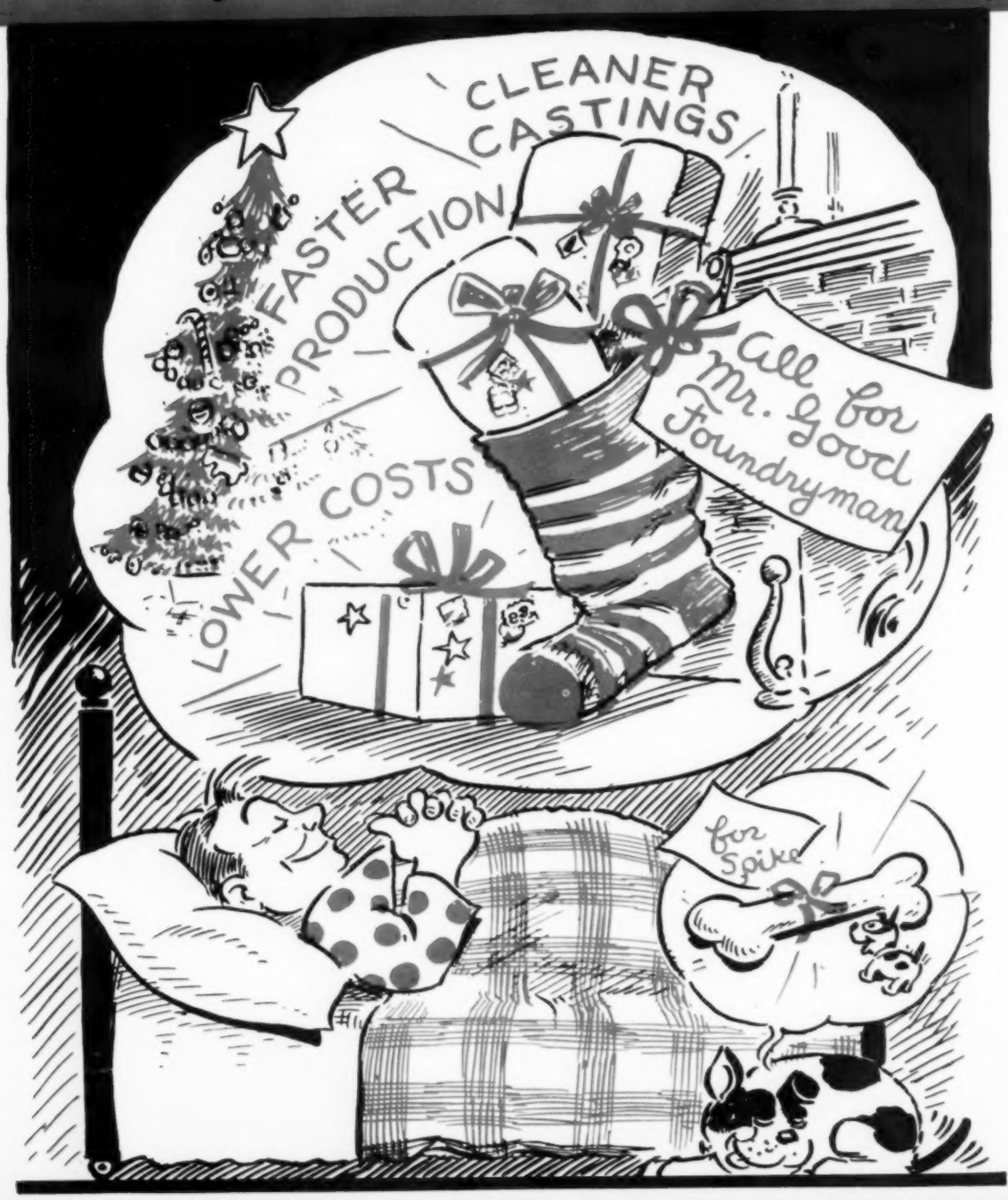
Holiday Greetings

To the old friends whom our service has brought us—to all those whom we hope to serve in the future, we extend our greetings. The period of uncertainty has past, the New Year has the green light for bigger and better business. May it bring you an overflowing measure of Happiness and Prosperity.

Great Lakes Foundry Sand Co.
Detroit, Michigan

Jno. S. Cronmiller — W. J. Mackintire — Kate I. McCutchen
F. Weaver — H. R. Mackinnon — J. H. Mendenhall
S. H. Cleland — L. Jones — Luther C. Kuhl

Merry Xmas and a Pros



The FEDERAL FOUND

4600 E. 71st St.,

— *Factories* —
Cleveland Chicago Charleroi, Pa. Upton, Wyoming

— *Warehouses* —
Detroit Milwaukee Minneapolis St. Louis

—Stocks of Federal Green Bond are now carried in England at Manchester, Hull and

osperous New Year with

FEDERAL GREEN BOND

THE WORLD'S LARGEST BENTONITE PLANT

THE WORLD'S MOST MODERN BENTONITE PLANT

PLANT NO. 2...JUST COMPLETED...BENTLEY SPUR, UPTON, WYO.

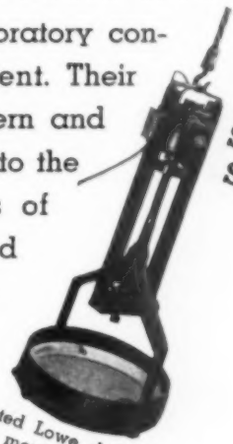
The users of Federal GREEN BOND are assured of Laboratory controlled-uniformity—high quality and prompt shipment. Their requirements are now cared for by the most modern and efficient plant of its kind in the world, in addition to the original Federal GREEN BOND Plant. Users of Federal GREEN BOND have at their command the services of our technically trained Service Engineers. Federal GREEN BOND is

SOLD WITH SERVICE

Twisted Stem Chaplets

The twist does the trick—forming four knife-like fusion edges from head to head—assures perfect fusion. Made from special analysis steel. Cost no more than ordinary chaplets.

Lowe High-Speed Sifter



The patented Lowe design makes Lowe the fastest, most durable and most economical sifter today. Made in four models—$135.00 to $150.00 f. o. b. Cleveland. 10-days' free trial.

LOWER COSTS
FASTER PRODUCTION...CLEANER CASTINGS

1. **CHARLEROI SEACOAL**—Cleaner Casting—20% saving.
2. **STAR CORE PASTE**—Pastes hot or cold cores—large or small cores—air dries.
3. **CHAMPION BLACKING**—Compounded of high-heat-resisting graphites.
4. **NON-SILICA PARTING**—Non-injurious—economical—approved by insurance companies and health authorities.

Chamberlain Co., Inc. of Los Angeles are sole distributors of Federal Twisted Stem Chaplets and Federal Non-Silica Parting in California, Nevada and Utah, and carry stocks for quick delivery.

RY SUPPLY COMPANY

Cleveland, Ohio

—New York Office— 4179 Park Ave.

—Richmond, Va. Office— 2213 West Grace St.

— European Concessionaires — The District Chemical Co., Ltd., 10½ Fenchurch St., London, E. C. 3 London and in Continental Europe at Antwerp, Havre, Genoa, Barcelona and Bilbao.

Better Sand CHEAPER QUICKER WITH A ROYER Better Castings CLEANER SMOOTHER

SAND SEPARATOR AND BLENDER

Portable Models 9–15–30 Tons of Sand Per Hour

Stationary Models 15–30 Tons of Sand Per Hour

Ball Bearings Throughout–Ball Bearing Motors

–V Belt Drive–

Thoroughly mixed and aerated sand—smooth and velvety in texture—the kind of sand a molder loves to touch—is yours the minute you install a ROYER.

In one operation hot sand is cooled—hot gases released—new sand thoroughly mixed with the old and moisture content evenly distributed.

Let the ROYER work out your sand problems

ROYER FOUNDRY & MACHINE CO.

158 Pringle Street ROYER PRODUCTS RECOMMEND THEMSELVES **Kingston, Pa.**

★

ANNOUNCEMENT

THE PENTON PUBLISHING COMPANY

announces a new publication to be edited exclusively for those engaged in grinding, polishing, buffing and finishing. This new publication will be known as:

Abrasives

★ will be published monthly on the 10th. The first issue will be out January 10th, 1937.

★ will have a minimum guaranteed circulation of 15,000 copies reaching the foremost users of abrasive processes.

★ will offer those who manufacture, distribute, or sell abrasive equipment and supplies an advertising medium unexcelled for the receptiveness of its vast, selected reader audience.

Further details are set forth on succeeding pages

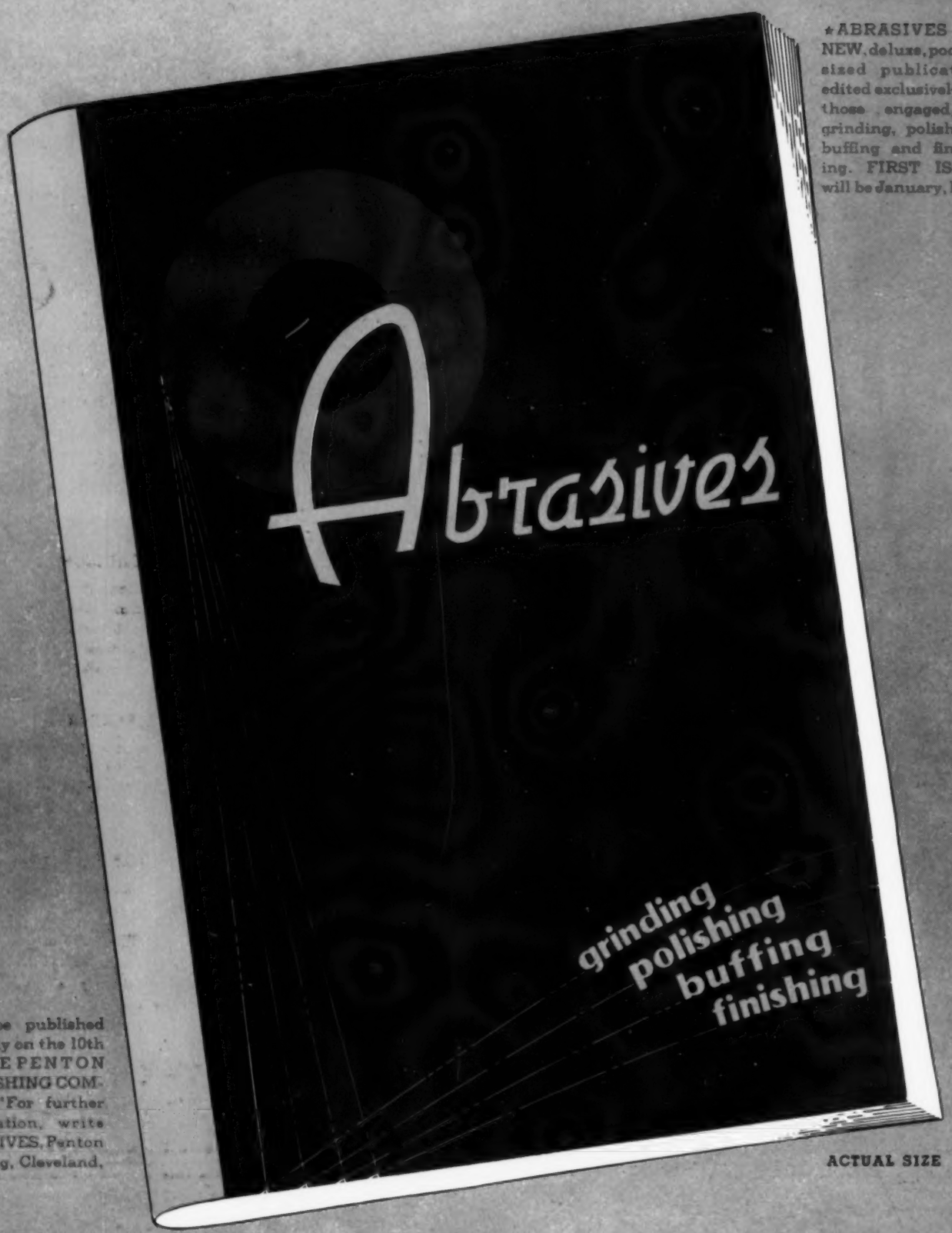
THE PENTON PUBLISHING COMPANY

PENTON BUILDING • CLEVELAND

★

NEW *from cover to cover!*

★ABRASIVES — A NEW, deluxe, pocket-sized publication edited exclusively for those engaged in grinding, polishing, buffing and finishing. FIRST ISSUE will be January, 1937.



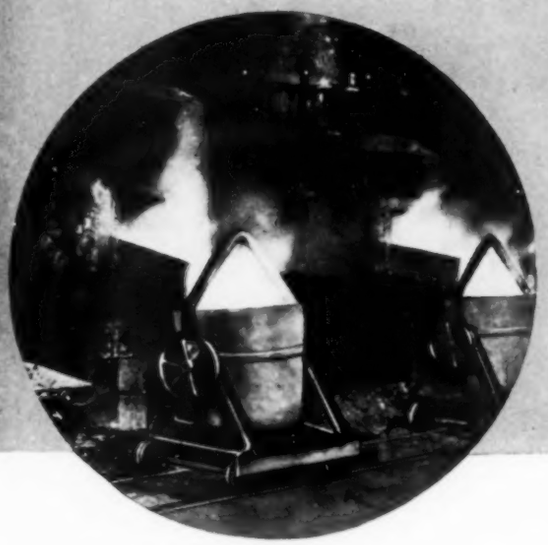
ACTUAL SIZE

★ To be published monthly on the 10th by THE PENTON PUBLISHING COMPANY. For further information, write ABRASIVES, Penton Building, Cleveland, Ohio.

15,000 guaranteed circulation

SPECIAL FOUNDRY GRADE

Ferrochrome for ladle additions of Chromium



For adding chromium to cast iron in the ladle, Special Foundry Grade Ferrochrome is ideal. Because it dissolves quickly in the molten metal, this special Ferrochrome produces a uniform distribution of the chromium and prevents hard spots caused by improper solution. High recoveries of chromium are assured. Iron of uniform structure and analysis is obtained.

With ladle additions of Special Foundry Grade Ferrochrome, any desired chromium content up to 1.25 per cent can be easily controlled. Thus desired properties for special applications can be obtained as shown by the following:

Property	Per Cent of Chromium	Typical Application
Wear-resistance	.25– .75	Cylinders
Heat-resistance	.75–1.25	Stoker links
Corrosion-resistance	.50–1.00	Fittings
Strength–fine grain	.25– .75	Heavy castings

Electromet Metallurgists, with years of practical foundry experience, will gladly show you how you can use Special Foundry Grade Ferrochrome to your advantage. Write for further information today.

PRODUCTS OF A UNIT OF UCC UNION CARBIDE AND CARBON CORPORATION

CHROMIUM
Low-Carbon Ferrochrome (in grades, maximum 0.06% to maximum 2.00% carbon)
High-Carbon Ferrochrome (maximum 6.00% carbon)
High-Nitrogen Ferrochrome
Chromium Metal
Chromium-Copper
Miscellaneous Chromium Alloys

• • •

SILICON
Ferrosilicon 15%
Ferrosilicon 50%
Ferrosilicon 75%
Ferrosilicon 80 to 90%
Ferrosilicon 90 to 95%
Refined Silicon (minimum 97% silicon)
Miscellaneous Silicon Alloys

SILICO-MANGANESE
All grades including Silico-Spiegel

• • •

MANGANESE
Standard Ferromanganese 78 to 82%
Low-Carbon Ferromanganese
Medium-Carbon Ferromanganese
Spiegeleisen
Manganese Metal
Manganese-Copper
Miscellaneous Manganese Alloys

• • •

COLUMBIUM

• • •

TUNGSTEN

CALCIUM
Calcium-Silicon
Calcium-Aluminum-Silicon
Calcium-Manganese-Silicon

• • •

ZIRCONIUM
12 to 15% Zirconium
35 to 40% Zirconium Aluminum-Zirconium

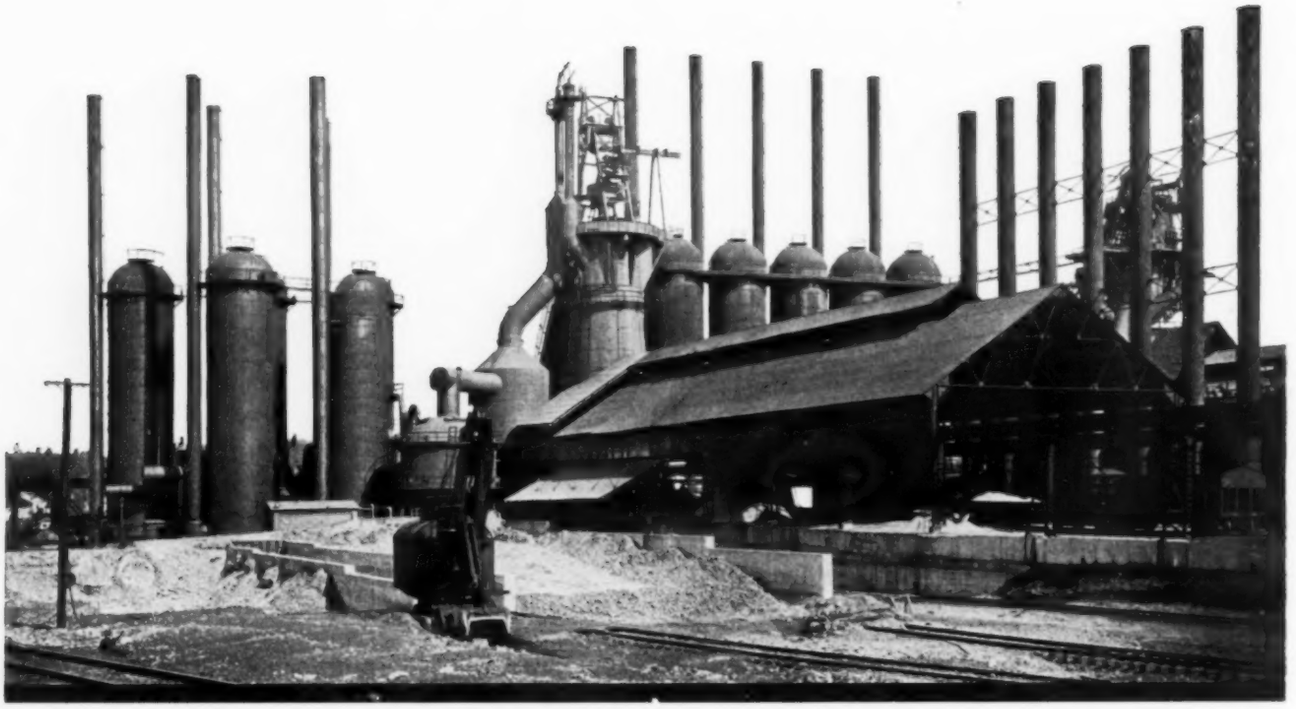
• • •

VANADIUM
All Grades

• • •

BRIQUETS
(Patented)
Chrome Briquets
Manganese Briquets
Silicon Briquets

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
CARBIDE & CARBON BUILDING **Electromet** Ferro-Alloys & Metals 30 EAST 42nd ST., NEW YORK, N.Y.



● *BLAST FURNACES Nos. 1 and 2.—The modern blast furnace, such as those pictured here, has been described as the "largest and most spectacular unit of industrial equipment in use today." In the furnace, the graded ore is reduced from the oxide to the metallic state, a task which challenges the best efforts of highly trained furnace men. The three Woodward furnaces have an annual capacity of 500,000 tons of pig iron.*

Independent SINCE 1883

In the maintenance of its position as an independent iron producer since 1883, the Woodward Iron Company has always taken an especial pride. It has believed—*and time has proved it right*—that Woodward's independence constitutes an asset of *vital value*, not merely to itself but to those whom it serves.

Woodward's independence has enabled it to so mould its policies and direct its developments as to align its activities with the needs of its market, without regard for any of those extraneous interests which would have to be considered were it but a cog in some giant corporation with management dictated from afar and dominated by conditions beyond its control.

Woodward's independence has made it possible for this company to concentrate *solely* on the production of *better* iron, without thought to steel or any other products which compete with its customers.

And finally Woodward's independent policy of restricting its production exclusively to pig iron has won for it the implicit confidence of customers, who recognize that Woodward's interests and their own are always the same.

● ***America's Largest Completely Integrated and Entirely Independent Merchant Iron Producer.***

WOODWARD IRON COMPANY
Woodward, Alabama

"MORE FOR YOUR MONEY"

THAT'S WHAT YOU GET WHEN YOU SPECIFY

PANGBORN

Bulletins furnished upon request.

AIRLESS
ROTOBLAST
CLEANING MACHINES
CLEANS gray iron, malleable and steel castings; forgings; heat-treated parts, etc.
Eliminates use of compressed air, pressure tanks, hose, nozzles, valves, air chambers, etc.
Users claim savings of $1.00 or more per ton.
BLAST CLEANING ROOMS
BLAST Rooms can economically be brought up-to-date by adding separate Pangborn features such as Separators, Elevators, Seal-Tight Doors, Blast Machines, etc.
DUST COLLECTORS
PROTECT your equipment from the destructiveness of dust by an all metal frame, cloth screen, Pangborn Dust Collector. Sizes for large and small requirements.

IT'S cheaper to buy new Pangborn Blast Cleaning Equipment NOW than to go along with the old . . . because, today, thanks to engineering advancements and improved skill with metal alloys, you get "more for your money" on every purchase made than you ever got before.

Take, for instance, the **ROTOBLAST**. Here is science's latest contribution to advanced foundry practice . . . the truly modern blast cleaning machine that—

1—Lowers cleaning costs
(at least one dollar per ton)
2—raises quality of cleaning
3—increases production
4—reduces costly "down time"
5—guards health of employees
6—promotes shop efficiency

Like the new 1937 automobile, today's **ROTOBLAST** is a marvel of simplicity . . . a joy for getting work done swiftly, smoothly . . . and at lowest power cost. To own this Pangborn Barrel, or Table, or a Special Automatic Machine is good business management because it reduces costs while increasing production . . . and is good sales management because castings are cleaner and have a finer finish for enameling, plating or other processing when **ROTOBLAST** cleaned.

The benefits of many lower equipment prices . . . better values always . . . will be your lasting satisfaction as soon as you specify and receive Air or Airless Blast Cleaning and Dust Collecting Equipment designed and built by those who have specialized in this field for more than thirty-two years.

Send for latest catalogs.

PANGBORN

WORLD'S LARGEST MANUFACTURERS OF BLAST CLEANING AND DUST COLLECTING EQUIPMENT

PANGBORN CORPORATION • • HAGERSTOWN, MD.

REPUBLIC PIG IRON

REPUBLIC STEEL

IS MADE ESPECIALLY FOR FOUNDRY USE

- **"REPUBLIC"** (Youngstown, Ohio) *Bessemer and Basic*
- **"NIAGARA"** (Buffalo, N.Y.) *Foundry, Malleable and Basic*
- **"McKINNEY"** (Cleveland, Ohio) *Foundry, Malleable and Basic*
- **"PIONEER"** (Birmingham, Ala.) *Foundry and Basic*

Knowing the purpose for which a product is to be used is half the making. Materials, equipment and manufacturing practice are important, too, but they depend to large extent upon the use for the product. That's why the men who control the manufacture of Republic Pig Iron are metallurgists and chemists experienced in foundry practice and casting requirements.

These men have one purpose in mind from the selection of the raw materials to the casting of the pigs — the production of high quality merchant iron for foundry use—the insurance of correct chemical composition and grain structure and uniform melting characteristics required in producing sound castings.

If you are experiencing casting troubles, whether due to the iron you are using or not, ask us to send one of Republic's traveling metallurgists. He knows foundry practice in every detail—and he will work with you in eliminating the trouble.

Republic Steel
CORPORATION
GENERAL OFFICES — CLEVELAND, OHIO

MORE THAN A MILLION TONS A YEAR OF HIGH QUALITY MERCHANT IRON

When writing Republic Steel Corporation for further information, please address Department FN.

THE FOUNDRY

For December

Announces New Editor of The Foundry

THE PENTON PUBLISHING CO. announces that Frank G. Steinebach has been appointed editor of THE FOUNDRY, succeeding Dan M. Avey who has resigned to become secretary-treasurer of the American Foundrymen's association, as announced on page 39 of this issue. Mr. Avey also has resigned as director and vice president of the Penton Publishing Co. and has disposed of his holdings in that company.

Mr. Steinebach was born at Bourbon, Ind., Nov. 25, 1896. He attended the public school and graduated from high school in Plymouth, Ind. Three years later he entered Purdue university where he was graduated in 1922 with a degree of bachelor of science in electrical engineering. Prior to graduation, he enrolled in the officers training school at Camp Zachary Taylor and was commissioned as a second lieutenant in the field artillery. Following graduation he became connected with the Penton Publishing Co. as editorial representative of *Iron Trade Review*, now *Steel*. In 1924 Mr. Steinebach was transferred to the editorial staff of THE FOUNDRY and in 1925 became associate editor of that publication. On Jan. 1, 1929, he was appointed managing editor of THE FOUNDRY, which position he has held to the present time.

Mr. Steinebach has taken an active part in association work in the foundry field. He is serving as chairman of the International Relations committee of the American Foundrymen's association, and also is the chairman of the Northeastern Ohio chapter of that organization.

Pat Dwyer, whose inimitable "Bill" stories and numerous articles on the practical aspects of foundry work have brightened the pages of THE FOUNDRY since 1919 will continue as engineering editor.

Mr. Dwyer was born in Ireland and emigrated to America in the mid-eighties settling in New Glasgow, Nova Scotia. In 1891 he became apprenticed to the foundry of I. Matheson & Co., New Glasgow, and 4 years later, at the age of 20, he became a full fledged journeyman molder. During the next 10 years Mr. Dwyer worked in many Canadian and American plants, traveling as far west as Detroit and as far south as Norfolk, Va., and obtaining a splendid background of foundry knowledge. He returned to Nova Scotia in 1901 and in 1910 was made foundry superintendent of the Sydney Foundry & Machine Works, Sydney, Nova Scotia. He joined THE FOUNDRY staff in 1919.

PAT DWYER
Engineering Editor

FRANK G. STEINEBACH
Editor of THE FOUNDRY

EDWIN BREMER
Metallurgical Editor

Edwin Bremer, who has handled much of the editorial work in THE FOUNDRY pertaining to the metallurgy of the casting process in both ferrous and nonferrous metals, will continue as metallurgical editor.

Mr. Bremer was born in Buffalo and was graduated from a Buffalo high school in 1911. For 9 years he served in the laboratories of a number of firms specializing in metals, chemicals, gas and rubber. In 1920 he was made chemist, American Radiator Co., Litchfield, Ill., and a year later he entered the University of Illinois. Following graduation in 1925 he became connected with the editorial staff of THE FOUNDRY.

Robert C. Wellman, a graduate of Williams College, is editorial representative of THE FOUNDRY.

Apprentices at the Caterpillar plant work to a definite schedule which takes them to the various departments of the foundry during the 3-year training period

Caterpillar Trains Foundrymen and Patternmakers

By K. P. Crowell

Supervisor of Plant Training, Caterpillar Tractor Co., Peoria, Ill.

ABOUT 1920, the management of the Caterpillar Tractor Co., Peoria, Ill., saw that the better grade of skilled foundry craftsmen was becoming scarcer all the time and no one was doing a great deal to relieve the situation. At the same time, the influx of European skilled labor was being decreased more and more each year through immigration laws and the demand for skilled labor in the European countries. Realizing that it was a responsibility of American industry to correct this alarming condition, the company decided upon an apprentice program.

In June, 1926, the Caterpillar organization began training young men at the plant in Peoria. At first, machinist apprentices only were indentured, but as the company became better organized, it continued to add boys for training in other departments. Later pattern making and foundry apprentices were included. Still later the company began a course of practical training for graduate mechanical engineers, and the last course added was a 2-year machine shop training course for young men too old to be indentured in the regular 4-year machinist apprentice course. So far the latter has proven to be a worthwhile step. While training is by no means as complete as the regular 3-year apprentice course, it does give the young men an excellent opportunity to enter a systematic course of study.

The apprentice course in foundry practice was undertaken in 1930. At first, 15 high school graduates, who indicated to those in charge that they would be worthwhile candidates for foundry and pattern-shop training, were selected. As time went on and the depression became more acute, there were no additions made to the original class. Through the natural process of elimination, that number was reduced to 11 boys. Because the plant was not working full time, it took 4 years to put the group through the 3-year training course. In May, 1934, the school reorganized the foundry training department and at the present time, 46 boys are being trained as foundry apprentices.

The question often is raised as to why it is next to impossible to interest young men of the higher type in the foundry industry as a career. This probably is due to the reputation the foundry gained for itself in the past. In the last few years, however, an entirely different viewpoint has been taken regarding this very highly artistic branch of the metal trades industry. More and more, those familiar with the production of castings are beginning to consider the foundry trade as an art. The industry realizes that things should be done scientifically instead of more or less by guesswork, or the practice of cut

A group of the pattern shop and foundry apprentices at Caterpillar. Mr. Crowell, supervisor of apprentice training, is at the left, and Mr. Whittfoht, assistant, at the right

The boy spends 37 hours each week in the foundry doing useful work under regular shop conditions

and try. When the foundry industry is developed as scientifically as some of the other branches of the metal trades industry, you are going to see more and more of our young men turning to the foundry for a career and as an outlet for their talents.

High School Course a Prerequisite

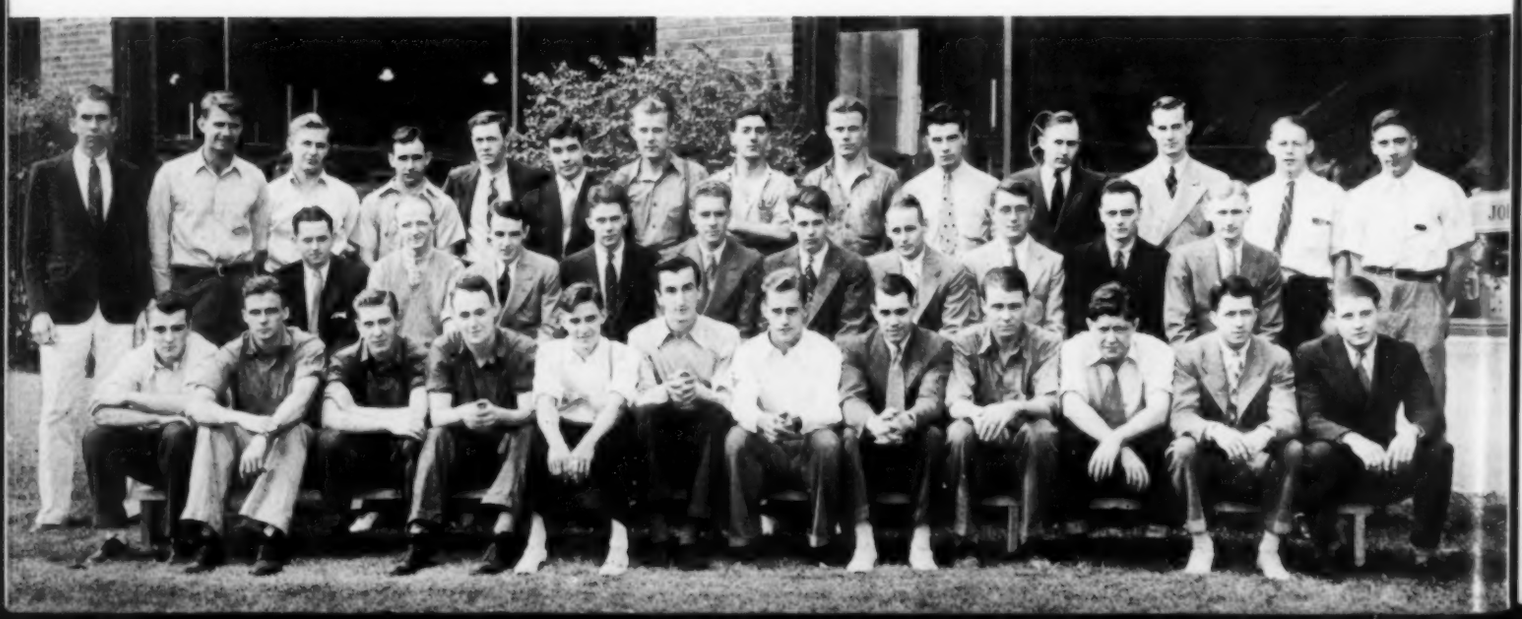
All the boys entering the foundry apprenticeship course at Caterpillar are high school graduates between the ages of 17 and 19 inclusive. Before the boy is given any encouragement regarding the prospects for his training, he is given a copy of the terms of apprenticeship or agreement and is required to take this home with him. After a thorough study of the terms, if he still is of the opinion that he believes he will like foundry training, he is given a date to return and take an oral and written examination.

In the written examination, it is possible to determine to a fair degree how much of the more practical part of his former training he has been able to retain. Through talking with the boy, the instructors can determine more accurately whether he really is interested in the foundry as a career, whether it is just fickle fancy, or whether he is just looking for a job. Sometimes the boy is interviewed several times, even taken through the foundry and classroom. Each step in the training program and in the foundry process is explained to him so he will have a clearer understanding of what he is entering. By so doing, it is felt that a much higher type boy is attracted and the turnover is reduced to a minimum.

Throughout the entire training period the boy spends 37 hours each week in the foundry doing useful work under regular shop conditions and production methods. The classes of work he performs are selected carefully from the viewpoint of providing the greatest amount of training value. While doing this useful work in the foundry he is under the direction of the superintendent and foreman. Each boy is visited several times every week by a competent supervisor whose sole duty is to see that the boy receives the proper training to enable him to become a highly skilled foundryman. The foundry apprentice also spends 3 hours each week in the class room, and is paid the regular hourly rate for this time.

The first 8 months of the boy's training is spent in making and assembling cores. The first month is devoted to making small cores on rollover-draw machines, strainer, gate and miscellaneous small cores. In the class room work, he is given core making practice as his related subject matter. The second and third months of shop training are spent in producing small cores on bench and other miscellaneous bench work, with a review of previous schooling also in the class room. During the fourth and fifth months the boy is on small core assembly, cleaning, patching, rubbing, venting and assembling small cores, such as cylinders, cylinder heads etc. School work and review of previous schooling also is carried on. The sixth

The Caterpillar company also maintains a training course for young graduate engineers



month is spent on larger core assembling similar to small assembling except that larger cores are used, crank and transmission case cores and cores of like nature, with ratio and proportion occupying the classroom time. The seventh and eighth months are devoted to making large cores on rollover draw machines, these consisting of composite cores requiring reinforcing and venting. This work is supplemented with the study of foundry raw materials, their selection and preparation.

During the ninth month the boy is on the molding sand mixer, reclaiming, blending and tempering, molding sand and facing mixtures. He is in the sand control laboratory doing routine testing and grading of new and reclaimed foundry sands during the tenth month. The related subject matter considers the testing and grading of foundry sands. The eleventh and twelfth months are spent on machine molding, snap-flask production and molding on jolt-squeeze machines. The thirteenth, fourteenth and fifteenth months are applied to machine molding, cope and drag production molding, setting cores and finishing molds on medium size castings. School work consists of general foundry mathematics.

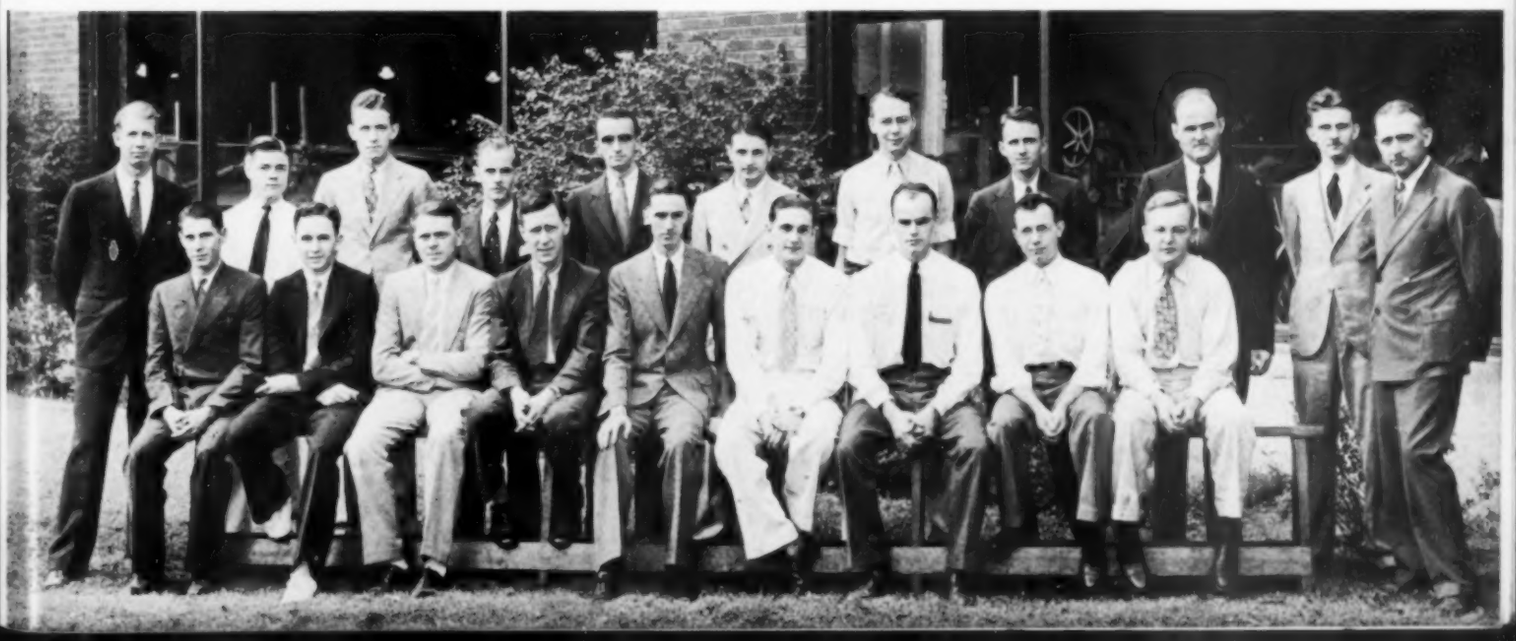
The boy learns of mixed jobbing molding problems, mixed molding on loose patterns, hand ramming, gating, etc. during the sixteenth, seventeenth and eighteenth months. In school he studies the theory of gates and risers and calculates the weight of castings. He is a sandslinger helper and operates in conjunction with the regular production of molds on the sandslinger during the twentieth and twenty-first months. Geometry, both plane and solid, is studied in school. The twenty-second and twenty-third months are spent on the sandslinger, setting cores on the floor and finishing molding on medium size work. The twenty-fourth and twenty-fifth months are spent in the cleaning room removing core wires, grinding and chipping castings. This affords the boy an excellent chance to get a complete picture of what his previous training and work has produced. The school work at this period consists of angular calculations and similar figures.

All boys entering the apprenticeship course are high school graduates between the ages of 17 and 19, inclusive

Casting Inspection Follows

During the twenty-eighth and twenty-ninth months, he works in the casting inspection department where the final checking of castings is made. Here he learns to locate defects and becomes acquainted with the requirements of commercial castings. The thirtieth and thirty-first months the boy spends in the physical laboratory doing routine laboratory analysis of scrap and machine shop salvage to determine the cause of failure. He then follows through to see that the remedy that is applied is effective. Related subject matter deals with metallurgy and metallography of iron and steel.

The boy spends the thirty-second, thirty-third and thirty-fourth months on cupola repairing and relining of cupolas and ladles. (*Please turn to page* 68)



Instructors in the training course and a group of graduate engineers at the plant

Correlating Properties With Service Requirements

By R. C. HEASLETT

Metallurgical Engineer, Eastern Division
Continental Roll & Steel Foundry Co., Pittsburgh

Fig. 1—Group of miscellaneous small railroad castings in the foreground

This is the first of two articles from a paper presented before the Pittsburgh Foundrymen's association. The second installment will appear in an early issue.

IN RECENT years, a large tonnage of castings has been sold to chemical specifications, physical specifications, or both. If these are not specified, the much more important item, *service requirements,* is the guiding factor which dictates to the foundryman what physical and chemical characteristics the casting should have. Since the physical characteristics of a casting, whether of iron or steel, play such an important part in its service requirements, it would seem in order to mention and discuss briefly the several physical properties or characteristics which have been or eventually will be written into the specifications of many casting requirements of the future.

Few properties of iron and steel are of more importance than that of hardness; for example as with a cutting tool the metal is practically valueless unless it can retain a sharp edge, while in other instances where the material has to be machined, especially in production quantities, a relatively slight increase in hardness is the cause of much inconvenience and expense. Again a metal of high hardness usually indicates a good wearing surface, and resistance to abrasion, but may also indicate a degree of brittleness and untrustworthiness which might otherwise be unsuspected.

Hardness usually is defined as the property of resisting penetration, and conversely a hard body is one which under suitable conditions readily penetrates a softer material. Characterization of hardness of metals may vary depending upon the form of stress to which the metal is subjected. These include abrasion hardness, cutting hardness and mineralogical hardness, the latter having been defined as the resistance offered by a material in any given smooth surface to abrasive pressure.

The brinell method of testing the hardness of a material is perhaps the most used of the several methods. It consists in pressing a hardened steel ball into the surface of the object by a fixed load. The dimension of the impression thus formed is measured and is the basis of calculating the hardness. The brinell method of determining hardness is simple and commercially efficient, and finds wide application as well as a wide field of usefulness. It is chiefly for accuracy where the number of pieces tested is not especially large, and where they can be brought conveniently to the instrument. For production work where a great number of pieces are to be tested the rockwell method is most used. Its utility is chiefly in the automobile parts industry and is not often a part of the foundry testing equipment.

The scleroscope is particularly adapted for obtain-

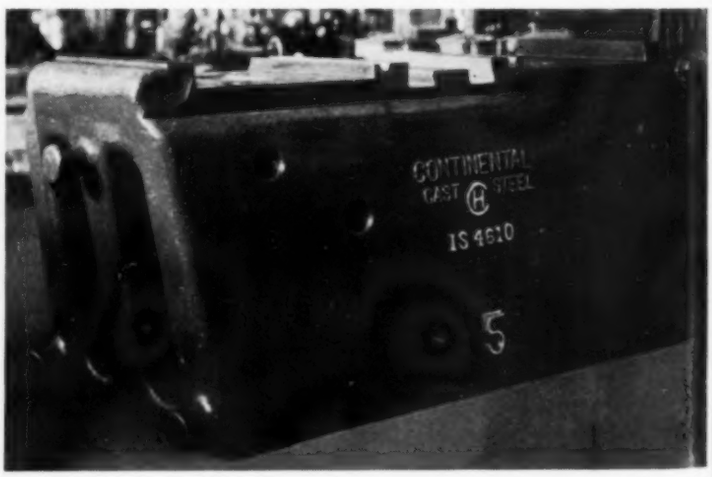


Fig. 2—Hammer block for a forging machine base weighs 162,780 pounds

ing comparative hardness on heavy parts such as large steel castings or steel and chill rolls. Its usefulness consists chiefly in its ease of operation and convenience. There are other ways of obtaining hardness of materials by such methods as monotron and Vickers, but since these are used rarely in foundry determinations, they will not be discussed.

Conversion tables for brinell, rockwell and scleroscope determinations are in common use but care must be used in applying conversion values since the comparisons are only approximate. The form of the part being tested, the springiness of the part, the method of holding the part and other factors may develop fictitious values. These tables are not recommended for nonferrous metals, and steels of certain composition may show different comparative values than those shown in the tables.

Hardness to a large degree is dependent upon carbon content, it being the most potent element influencing this characteristic. All other factors being equal, the higher the carbon the higher the hardness. However, another important factor in producing hardness is a heat-treatment which consists of some method of quick cooling. This procedure usually consists of either liquid or air cooling.

Hardness Obtained by Two Methods

Therefore, to obtain the desired hardness, the decision must be made whether to obtain it by analysis, or treatment or a combination of both. The latter is the usual procedure especially in steel castings. The design and size of the casting first determine what type of heat treatment should be employed. That is to say, if it is intricate and has some heavy sections, liquid cooling may be deemed unwise, in which event compressed, fan or still air would be utilized.

The next step is to decide upon the most economical analysis to produce the desired hardness by the treatment previously decided upon. But before making this decision several factors must be considered, and these bear directly upon the thickness of section in question. As an example observe what happens to a 0.50 per cent carbon plain steel when quenched in water. Five pieces

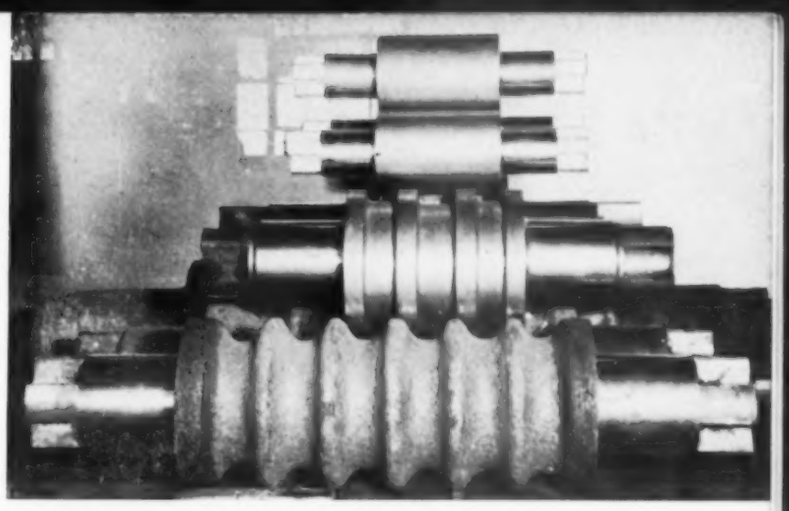


Fig. 4—Pyramid of chilled iron, steel and grain rolls

ranging in diameter from 1 to 5-inches were quenched and the hardness results on the surface noted.

Diameter	Brinell
1 inch	592
2 inches	401
3 inches	341
4 inches	293
5 inches	255

Although the 1-inch section piece cooled quickly enough to form the hard constituent martensite, the 5-inch section cooled so slowly that only pearlite was formed. The intermediate hardnesses were a mixture of martensite and fine pearlite, having progressively less martensite as the section increased. The nonuniformity of hardness in these sections from the outside to the center also was noted:

Center Diameter	Brinell
1 inch	321
2 inches	285
3 inches	248
4 inches	229
5 inches	223

Since this steel shows such irregularities when given even a drastic water quench, it may not be suitable for the service requirements. Suppose we therefore choose a steel having a composition about as follows: Carbon 0.40 per cent; manganese, 0.75 per cent; silicon, 0.30 per cent; chromium, 0.80 per cent, and molybdenum, 0.25 per cent. Water quench it as before and note the results: (*Please turn to page* 71)

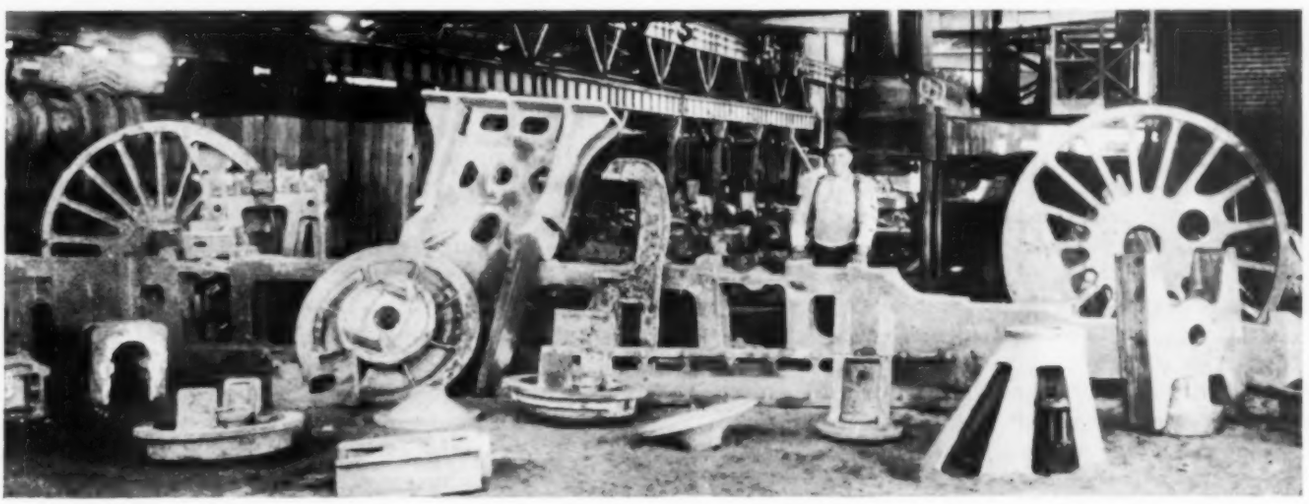
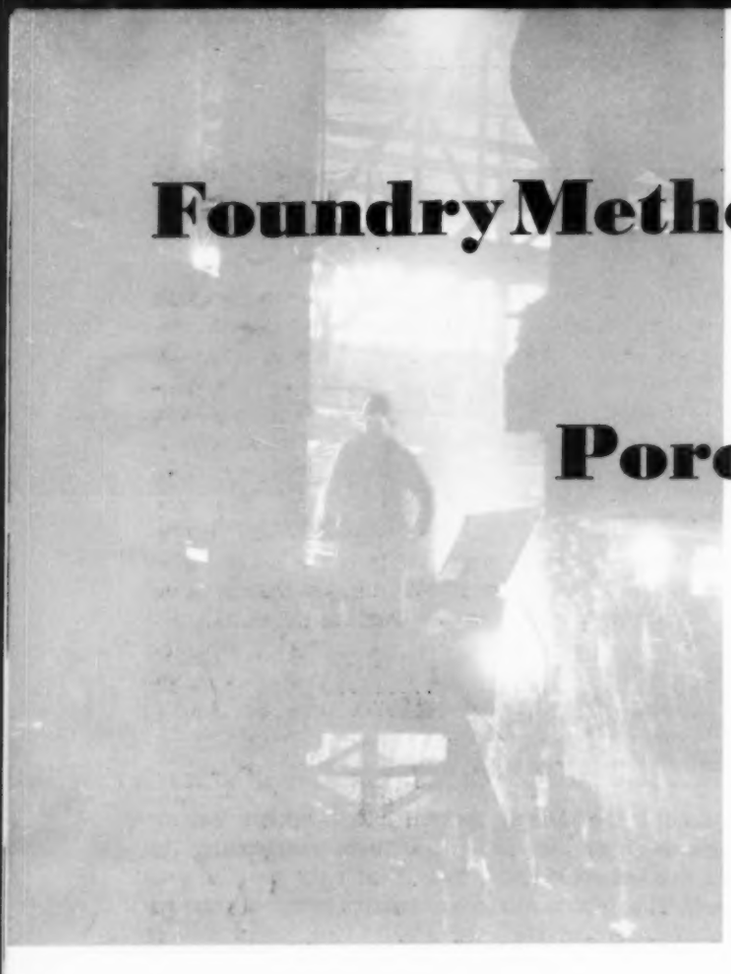


Fig. 3—Driving wheels, side frames, driving boxes, cross heads, and other types of steel castings for locomotives



Foundry Methods for Producing Cast Iron for Porcelain Enameling

By R. B. SCHAAL
Ferro Enamel Corp., Cleveland

TODAY much of the production of cast iron enameled parts must be white, to match white parts in sheet steel. The desired opacity and color can be obtained only in enamels of the leadless type. Furthermore, health regulations in many localities prohibit the use of lead bearing enamels.

Leadless enamels, today, do not approach the old high lead types in universal workability. On certain definite and carefully controlled types of cast iron one coat color work may be very successful in leadless enamel. The production of white and pastel colors in two coats, even on these irons, is comparatively undependable. Two color work is practically impossible on most present-day castings without the use of a ground coat.

Development of cast iron which will take leadless enamel successfully, as well as the development of leadless enamel which will enamel a wide variety of castings by direct application will come. Industry always has responded to necessity. Although this study has been in progress for several years, the problem is by no means solved. Major changes are not accomplished overnight, but are the result of untiring effort over a period of time.

The problem of a proper sheet iron for enameling has been met successfully. Sheet iron for enameling, bought from only a comparatively few sources, and highly standardized, reduces the problem of successful enameling of sheet iron to comparative simplicity. Nearly every enameler who enamels cast iron has his own foundry, and no two foundries produce cast irons alike in enameling properties.

Fortunately, through experience, certain basic ideas have been well established which, if applied and rigorously controlled, will improve the quality of castings produced, and tend greatly toward uniformity, thus making enameling much easier and *less costly*.

One can not get from a cupola furnace better material than is put in. Good melting practice will preserve, but poor melting practice will ruin the properties of excellent raw materials. Before good castings can be obtained, the raw materials from which they are made must be above suspicion. These raw materials include, pig iron, foundry returns, scrap, coke, limestone and miscellaneous fluxes.

Pig irons vary extremely in their ability to produce castings with good porcelain enameling qualities. Each pig iron, regardless of analysis has its own personality. By trial and experience one can discover the individual peculiarities of each brand of pig iron, and all pig irons which are economically available should be tried thoroughly. Final selection of two or three suitable brands then can be made on the basis of these trial results, and these brands bought consistently.

High Carbon Iron Is Best

After selecting the brands of pig iron, every effort should be made to see that each shipment is exactly the same. A complete chemical analysis will show the consistency or inconsistency among shipments of the same brand, although this never will be a good guide between different brands. It will be found that the best irons for enameling are high in carbon and *very low* in sulphur. Once the total carbon in a certain suitable brand of pig iron has been determined, new shipments of that particular brand should not be allowed to fall lower in this element. Once the sulphur content of a particular brand is established, it should not be permitted to rise above the customary percentage.

It is essential that we be able to predict with reasonable certainty the analysis and metallographical characteristics of the castings, from the raw materials used for any given heat. The silicon, manganese and phosphorus content of the castings, are primarily dependent upon the analysis of the pig iron. It must

be possible, from the selection of pig iron available, to raise or lower these elements, at will, within limits.

To raise or lower the percentage of these elements as desired, it will be found convenient to have on hand, of the two or three approved brands, irons of four distinct analytical characteristics. The following analyses (exclusive of sulphur or carbon, which have been established, for each different brand) are suggested as convenient:

	Per Cent
1. Silicon	3.50
Manganese	0.80 or over
Phosphorus	0.60—0.40
2. Silicon	2.50 or over
Manganese	1.50
Phosphorus	0.60—0.40
3. Silicon	3.50
Manganese	0.80 or over
Phosphorus	1.75
4. Silicon	2.50
Manganese	0.80 or over
Phosphorus	0.60—0.40

With this combination, any of the three elements may be raised or lowered as desired. Knowing the loss of silicon and manganese due to oxidation in the cupola and the changes in phosphorus, the final analysis may be predicted with reasonable certainty. A complete calculation illustrating a convenient way of doing this is shown.

Returns may come from the foundry floor, the cleaning department due to breakage, the enameling shop, the stock department or the assembly lines. In the foundry making light (⅛-inch) section castings usual for enameling, the floor returns will constitute a very large percentage of the total iron poured, due to the large amount of iron necessary for the gates, sprues and risers. Furthermore, since it is not good practice to use the iron which first runs from the cupola, this iron customarily is used for washing the hand ladles, after which it is pigged. Drainings of cold iron from the ladles, and the drop from the cupola at the end of the heat also will make up a certain amount of floor returns. Ordinarily the total floor returns will be 40 per cent, and may reach 50 per cent or even 55 per cent in certain cases. The chemical analysis of these returns will be close to the general analysis for the heat, and in the calculations for the next heat may be used as such.

Returns from other sources may have been porcelain enameled, especially from the assembly, stock and enameling departments. The presence of leadless enamel may be disregarded, but the use in any one heat of any sizable amount of high lead enameled returns will be detrimental. Lead bearing enameled returns should not exceed one-half per cent in any heat. The analysis of this section of the returns also will approximate that of the heat, and may be calculated as such.

Somewhat to be deplored in the foundry making castings for enameling, is the increasing use of outside scrap. If this type of material is used it should be employed only to make up a deficiency in returns and never in any considerable quantity. Only the very best No. 1 machinery scrap should be used. It should be entirely cast iron, free from steel. It should also contain no chromium, molybdenum or vanadium. Nickel is not so detrimental so far as porcelain enameling qualities are concerned. Automobile scrap, used grates or stove parts should be avoided. Broken lathe beds and analogous material, if the approximate analysis can be determined, constitute the best scrap for this purpose. It is recommended that not more than an average of 5 per cent of such material be used over a period of time, and not more than 10 per cent in any given heat. As a rule, scrap is low in silicon and carbon, and high in sulphur. In the calculation allowance should be made for this feature.

The type of foundry coke used will depend somewhat upon the makeup of the metal charge. As a general rule the greater the density of the metal charge, the denser the coke. In melting such material as returns from a stove foundry, the room occupied by a given weight of metal will be comparatively great, that is, the density of the metal charge will be comparatively low. The coke should possess a light, strong structure and the pieces should be as large as possible.

Cokes differ considerably, especially in regard to ash and sulphur content. Usually beehive cokes of porous, strong structure (*Please turn to page* 74)

Method of Calculating Mixture

			Silicon	Manganese	Phosphorus	Sulphur
Returns	Silicon	2.65	1.33			
50 per cent	Manganese	0.70	....	0.35		
	Phosphorus	0.70	....	....	0.35	
	Sulphur	0.075	....	....	....	0.038
Pig No. 1	Silicon	3.50	1.06			
30 per cent	Manganese	0.80	....	0.24		
	Phosphorus	0.60	....	....	0.18	
	Sulphur	0.02	....	....	....	0.006
Pig No. 2	Silicon	2.50	0.25			
10 per cent	Manganese	1.50	....	0.15		
	Phosphorus	0.60	....	....	0.06	
	Sulphur	0.02	....	....	....	0.002
Pig No. 3	Silicon	3.50	0.18			
5 per cent	Manganese	0.80	....	0.04		
	Phosphorus	1.75	....	....	0.09	
	Sulphur	0.02	....	....	....	0.001
Pig No. 4	Silicon	2.50	0.13			
5 per cent	Manganese	0.80	....	0.04		
	Phosphorus	0.60	....	....	0.03	
	Sulphur	0.02	....	....	....	0.001
Mixture			2.95	0.82	0.71	0.048
Losses and Gains in Melting			—0.25	—0.10	+0.01	+0.030
Calculated			2.70	0.72	0.72	0.078
Desired			2.65–2.70	0.70	0.70	0.075

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N. F. A. Convention Considers Management Problems

A VARIETY of problems pertaining to present day industrial management were discussed at the fortieth annual convention of the National Founders' association held at the Waldorf-Astoria hotel in New York, Nov. 18 and 19. More than 200 foundry owners and managers were present for the two-day program, which included speeches by leading economists and business men of the country and reports of activities of the association.

Speaking on "What Kind of Government Does the Business Man Want," Thomas W. Pangborn, president of the association, declared that friendly and sympathetic relationship between government and business is the first need of the business man and the government itself. In addition to a sympathetic and understanding government, the average business man wants a government that is honest, efficient and effective; one that understands its functions and discharges them, but which also understands its limitations and respects them. The business man wants a government which calls into its councils the best men it can get and makes it possible for them to stay on the job without loss of respect; moreover, a government which practices and teaches economy.

Mr. Pangborn stated that industry, on the whole, has understood its functions better and has done a better job than government. It is the purpose of industry to produce and distribute more and more of the things the people need and want and that job has been well done. The speaker declared that industry is doing a better job of selling itself to the public than it ever has done before. However, he pointed out that the task is a large, difficult and continuous one. Mr. Pangborn endorsed whole-heartedly the "good neighbor" policy of the federal government in relation to other countries and added that the "good neighbor" policy should begin at home. Any domestic policy which ignores the mutual interdependence of the American people is fraught with peril.

Mr. Pangborn stated that we cannot legislate safely on the basis that there is a natural antagonism between labor and management; between debtors and creditors; between farmers and city people; or between business and government. American business should again be free to resume its cycle of producing more and better goods for more people to use and enjoy. That, in Mr. Pangborn's estimation, is the American method of producing the more abundant life.

Productivity Key to Prosperity

Pointing to a definite change in the trend of American affairs, Dr. Virgil Jordan, president, National Industrial Conference Board Inc., New York, urged American industry to center its attention, as never before, on its primary function of producing goods and rendering business service. Industry must wage war against all forces that tend to reduce productivity, for this, he said, is the rock on which any hope of future prosperity lies. He warned industry to keep its head and not contribute to another speculative boom. If it loses its head now, it will do it literally when the next depression comes, he declared.

The speaker said that tools for marked changes in the form of American life have been forged. He regarded a transformation as inevitable, although stating that it will come gradually, probably without important out-

ward change for the time being. He believed the trend, as indicated by recent elections, was decidedly toward centralized form of government. He enumerated various steps pointing in that direction, which, in his opinion, already have been taken, but he insisted that there is one essential in the success of whatever course is ultimately followed, namely, productivity. Hence, it is important for industry to do all in its power to promote efficiency and thrift. American people still will have to work for the security and prosperity they expect to get, he continued. The measure of prosperity will be the amount of work they do in producing goods. It is up to them to create still more effective tools and to use wise discretion in the handling of national resources.

An interesting and entertaining discussion of "The Gas Hazards of Modern Industry" was presented by Dr. Howard W. Haggard, associate professor of applied physiology, Yale university, at the luncheon meeting. Dr. Haggard traced the history of poison gases from the time they were discovered to be harmful to mankind through to the present when various dangerous gases are encountered in the home, street and in industry. Gases may be classified as irritants, asphyxiants, and violent drugs. In industry, according to the speaker, workers can be protected from dangerous gases through proper ventilation and accepted guards such as gas masks, respirators, etc. Dr. Haggard said that the training of men in industry in the fundamentals of resuscitation should be undertaken as a part of the campaign to combat the gas hazards of industry. He warned against inexperienced first aid work.

At the afternoon session, Arnold Lunn, University of Notre Dame, South Bend, Ind., speaking on the "Communistic Peril in Europe," said that due to "muddle-headedness" communism has become a real threat not only in Europe but also in the United States. Communists, he said, have traded on the reluctance of the people to give the necessary time and thought to study of the problems. He advocated public debates between speakers of groups opposed to communism and speakers accredited by the Communist party as a means of presenting the issues to the public at large.

Co-Operation Is Foundation

Whiting Williams, Cleveland, in speaking on "Getting the Co-operation of Employe-Citizen," stated that during the depression years people have been searching for some law or device to settle differences between industry and labor. However, he believes that co-operation, the establishment of mutual trust still is a fundamental for solving these problems. One of the major difficulties in establishing harmonious employe-employer relationships is the depression-born fear of unjust separation from a job. Maintenance of the seniority system, the practice of adjudicating differences in the light of the workers individual experiences, and the return of prosperity, all are factors that contribute to a more satisfactory understanding between industry and labor.

Speaking on "Industrial Relationships," J. A. Voss, director of industrial relations, Republic Steel Corp., Cleveland, stated that fundamentally the problem before industry is how the best interests of employes can be served by the employer and conversely, how the employes can best serve the interests of the employer. Maximum benefits cannot be secured until the best interests of each are understood thoroughly.

C. J. Stark, president, Penton Publishing Co., Cleveland, publisher of THE FOUNDRY, *Steel*, and other business and industrial papers, spoke on "Today's Business and the Public." Mr. Stark stated that our resources in both skilled personnel and natural wealth, and our guarantee of individual opportunity within a free democracy have made this essentially a business nation. Our home market provides and will continue to provide the greatest outlet for our farms and factories.

Government Needs Business

It is unthinkable, in Mr. Stark's opinion, that the American public knowingly will impose such handicaps and restrictions on so beneficent an instrument as modern business. It is beyond belief that any sane and politically minded government, no matter how intent on social reform, deliberately will rob industry of its voluntary, self-generating powers, without which it cannot hope to prosper and progress. The speaker pointed out that it is well to bear in mind that no government ever created good business through its own acts and that no government can hope to be successful politically without good business.

On Thursday morning, Roger Williams, New York State Insurance Fund, New York, outlined a proposed attitude of foundrymen toward compensation and occupational disease legislation in an address entitled "Other Controllable Costs." Mr. Williams stated that foundrymen and insurance carriers have a more common interest and dependence than can be found in most other industries. He pointed out that proper protest against unjustly high rates for compensation purposes and setting up proper safe-guards to avoid accidents are means of obtaining lower rates.

Because industry recognized early the place and value of protection of workers in hazardous industries, the speaker raised the question of why industry has permitted others to administer these protective measures. As far back as 1900, elements of the steel industry discovered the economic value of preventing accidents, to reduce operating costs and increase wages of workmen. Sick benefits, retirement plans, group insurance and other benefits have been tried by industry without legislative pressure.

Mr. Williams holds that close and willing co-operation between industries of common dependence is far more satisfactory in anticipation of, rather than in defense of economic burdens. By adopting that attitude the foundry industry, and industry in general, can influence the selection of those who will administer laws and regulations. These otherwise economic burdens are controllable where there is proper knowledge, effective organization by community, state and nation, or even competitive bodies, who will unite, pool their interests and abilities and see their problems through.

Data of considerable importance to the foundry industry was presented by Philip Drinker, professor of industrial hygiene, Harvard School of Public Health, in an address "Uses and Limitations of Respiratory Protective Equipment." Effectiveness of respiratory protective equipment can be nullified (*Please turn to page* 83)

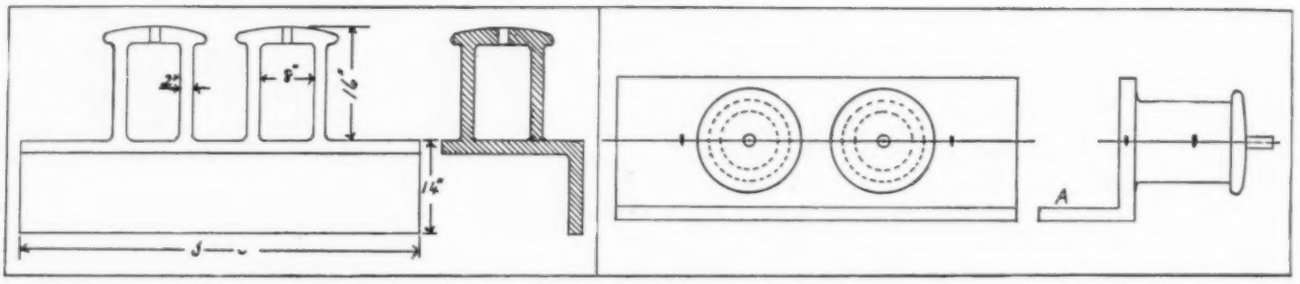


Fig. 1 (Left)—Plan and sectional view of dock wall double bollard. Fig. 2 (Right)—The pattern was split through the center of the barrel section with the angle shelf in the drag

Changes Method To Reduce Cost

By J. H. EASTHAM

THE dock wall double bollard weighing 1700 pounds, shown in Fig. 1 and presenting some peculiar features was an item in a long term contract for variety of castings booked at a flat rate per pound. Instead of a plain flat plate the base was formed of two plates joined at a right angle as shown. This feature of course increased the amount of work required on the mold.

Since the pattern was supplied by the customer, the foundry had no choice but to mold it according to the way it was drafted. As shown in Fig. 2, the pattern was split horizontally along the center line of the posts. The plate *A*, 12 inches wide and extending from end to end was designed to be molded in the drag. The order included 34 of these castings approximating 29 tons and could have been made at a handsome profit if the pattern had been designed properly, or if the proper molding method had been adopted for the existing pattern.

Open Sand Drawback Plate Made

This situation led to the making of an open sand drawback plate 6 feet in length, 18 inches wide, 2¾ inches thick, to carry the 12-inch overhang of green sand which covered the extension to the base plate of the casting. The body of sand was 9 inches high.

The lower half of the pattern was bedded in the floor and a parting was made along the joint line from the mushroom heads of the posts to the base, then vertically down along the face of the flange to the base extension and along its full width. A space about 8 inches at each end was provided for a bearing or print on both the vertical faces and lower horizontal joint. The drawback plate was rapped down to a bearing with the beveled edge ½-inch from the pattern. The space between was rammed full of facing sand, struck off level and nailed to prevent it from becoming displaced later. Parting sand was spread over vertical and horizontal joint faces after which the space above the lifting plate was rammed full of sand up to the floor level to coincide with the center parting line of the pattern.

To carry the 12-inch overhanging body of sand, reinforcement in the form of either a large number of straight rods, or cast iron grids was necessary. The molder was instructed to use rods, as "costing less" in the first place. A multitude of straight bars, each about 26 inches in length, was claywashed and bedded into the first course of sand laid on the drawback plate and pattern. At this stage the question of balancing the drawback during the lifting operation arose.

The problem was solved by stacking about 3000 pounds of pig iron as far back on the drawback as possible, but kept below the main joint line. A suitable sprue stick set on the lower joint at one end was rammed up with the reinforcement and balancing

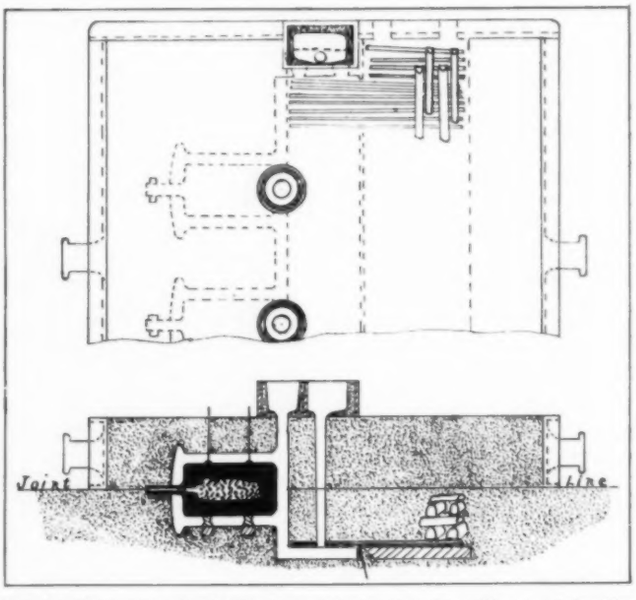


Fig. 3—Plan and sectional view of completed mold as originally constructed with counterweight on lifting plate

material. The main parting then was made and a suitable special barred cope 6 feet square rammed on top, staked, hoisted away, rolled over and finished in the usual manner. The upper half of the pattern came away with the cope.

Before removing the drawback the necessary clearance trench was dug from the joint to below the bottom flange level. The lifting chains were adjusted with turnbuckles and the plate with its load of pig iron, rods and sand carefully was hoisted out and placed on suitable stands for finishing. From this stage the remainder of the molding operation followed the usual routine. Particular attention was paid to securing the spool chaplets set top and bottom in each post to hold the lightening core. As shown in the accompanying illustrations the core in each post was supported by a small print only at one end. The principal purpose of the core print was as a vent outlet.

A strong silica sand oil bonded mixture was used in the cores. The number and size of the reinforcing rods was limited on account of the small opening in the mushroom head of the post. The interior of each core was filled with fine cinders to promote a free vent and to facilitate contraction of the casting. The cores were adjusted in place and all other operations completed before the drawback was replaced to obviate risk of sand falling into the lower flange with the attendant necessity of again moving the unwieldy load.

Introduced an Improved Method

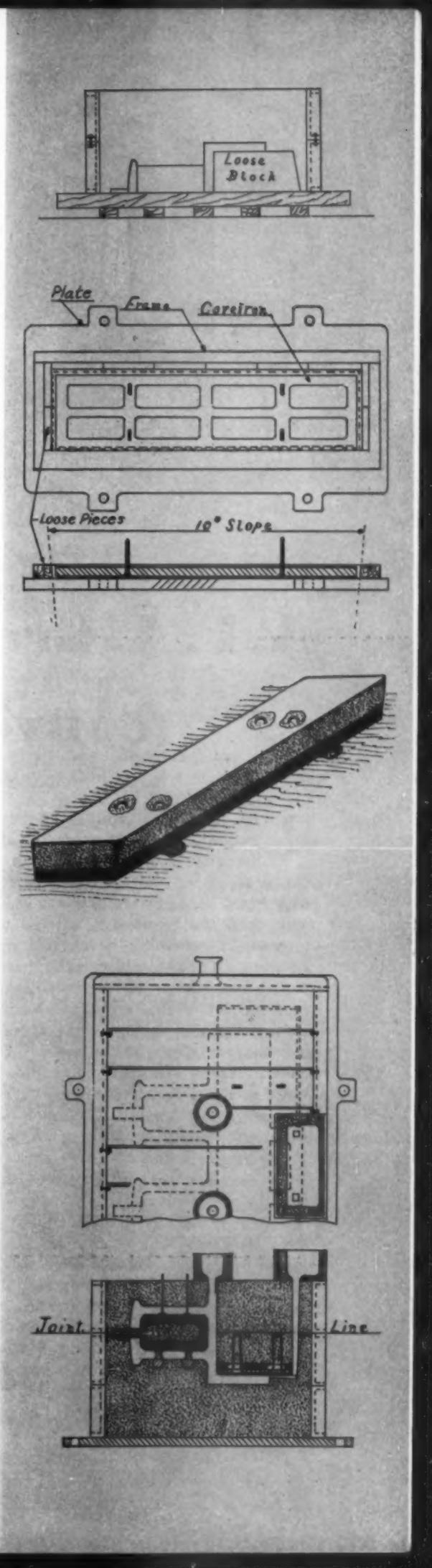
Clearance space around the drawback was rammed solidly to prevent the pressure of the metal moving the drawback and thus increasing the thickness of the casting. The cope was rolled over and lowered into place as shown in the detailed view of the assembled mold Fig. 3.

Four castings were made by this method when the superintendent resigned to accept another position. The castings represented creditable performance by skilled men, but the time and cost left much to be desired.

His successor stopped the job at once, but assured the customer that immediate steps would be taken to speed delivery. Three flask parts 12 x 48 x 78 inches were substituted for the 6-feet square cope. Two sections bolted together to form a drag 24 inches deep were placed on a strong rollover board as shown in Fig. 4. The drag half of the pattern was placed in the center with a loose joint or *follow* block under the rectangular flap. As the ramming progressed, suitable bearing blocks for the chaplets were placed on the pattern.

After the drag was rolled over, the follow block was removed and the faces of the resulting cavity were covered with damp parting sand. A slab core 4 inches thick, 18 inches wide and 6 feet in length was lowered into the print left by the follow block. The skeleton core frame with inner loose pieces at one side and both ends to match the 10 degree taper on the block is shown in Fig. 5. This illustration also shows the strong cast iron arbor with four hairpin shaped lifting loops each 9 inches high.

With the dry sand core in place the remainder of the space was filled with sand and rammed in the usual manner. Facing sand was banked against the pattern, but the remainder of the space was filled with floor sand. A few rods were placed horizontally in the corners for reinforcement. Sand was scraped off at the top and the joint made to conform with the remainder of the mold joint. The cope flask then (*Please turn to page* 84)



Reading down, Fig. 4—Loose pattern block fitted under the flange. Fig. 5—Plan and sectional views of core plate, frame and core arbor. Fig. 6—The slab core provided with lifting loops. Fig. 7—Plan and sectional view of mold made according to improved method

Aero-Graphic Corp. Photo

Aerial photograph of downtown Milwaukee, scene of the 1937 A. F. A. Convention

A. F. A. Groups Plan Milwaukee Convention Program

THE program committee of the American Foundrymen's association reports that the tentative plans for the 1937 Milwaukee convention promise a series of technical sessions, shop operation courses and round table meetings, which, combined with the extensive display of equipment and supplies provided the foundry show, will make the occasion outstanding in the history of the association.

The committee has given unusual attention to a schedule of sessions on management problems, a session under this section being listed for each morning and afternoon of the week. Subjects to be covered by noted speakers will be "Job Evaluation and Time Study", "Safety Methods", "Foreman Training", "Foundry Cost Methods", "Apprentice Training", and "Insurance Costs and Occupational Disease Laws". These sessions should prove attractive and of considerable value to a high percentage of those attending the convention.

The steel division will devote a large share of its time to listening to and discussing important committee reports on radiography, manufacture of liquid steel for castings, test coupons for heavy castings, specifications, steel foundry sands and heat treating developments. Two important technical papers which have been scheduled for this division are the fourth report of work on "Solidification and Contraction of Steel", by C. W. Briggs and R. E. Gezelius of the Naval research laboratory, and a report of an investigation on "Cement as a Bonding Material", by the Portland Cement association.

The malleable iron division is carrying out a study of shrinkage as affected by various carbon contents, with a large group of foundries participating. It is expected that a preliminary report of that investigation will be available for discussion at Milwaukee. Formal papers for the malleable session will deal with "Developments in Malleable Melting Methods", "Selection of Annealing Cycles and Furnaces for Annealing", and "Malleable Foundry Sand Control".

The gray iron division, as in the past, will have an extensive program of papers and committee reports on wear testing, cupola practice, alloy cast iron, fluidity tests, casting stresses in chilled iron, and effect of coke size on cupola melting. In addition, the division will hold its popular shop practice course, which is being organized by a special committee under the chairmanship of P. T. Bancroft of Moline, Ill. The sessions for the course will be on carbon control in cupola operation, gating and risering, and core making.

The nonferrous division for the first time will have a session devoted exclusively to sand control. This session is being organized under the division's newly organized committee on sand control, which is composed of G. K. Eggleston, Detroit Lubricator Co., chairman; D. F. O'Connor, Walworth Co., and D. M. Curry, International (*Please turn to page* 86)

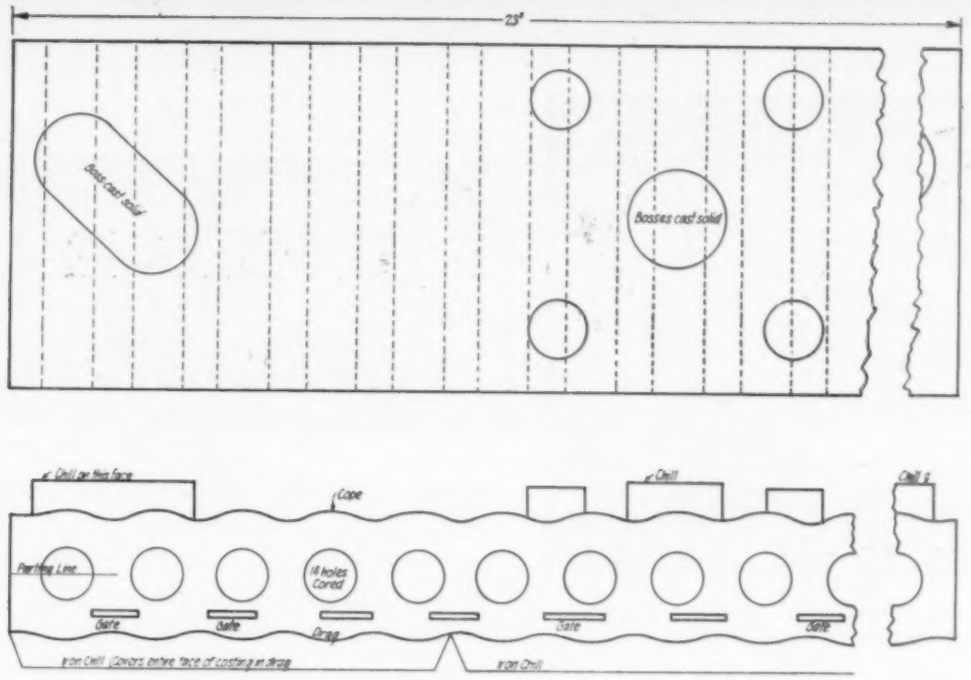


Fig. 1—Plan and side views of valve block castings which warped in cooling

Chills on Drag Warp Castings

THE accompanying sketch Fig. 1 shows a gray iron casting used as a valve block for hydraulic lifts and operates under 1000 pounds pressure. The casting weighs 45 pounds and is molded one at a time in a wood flask. The 14 cores are all made as a single unit with a print extending the full length of the pattern on both sides.

Analysis of the regular cupola mixture shows: Total carbon 3.42 per cent, silicon 2.38 per cent, manganese 0.61 per cent, phosphorus 0.176 per cent, sulphur 0.09 per cent, chromium 0.099 per cent, nickel 0.057 per cent. For this particular casting ladle additions are made to raise the chromium to approximately 0.38 per cent and nickel 0.20 per cent.

On account of the exceptionally severe service to which these castings are subjected, considerable trouble was experienced in their production. The first castings molded without chills developed porosity in various places between the cored holes. Chills applied to the drag face overcame this trouble, but caused the casting to warp slightly. The ends of the casting sprung up and threw the tops of the bosses and the cored holes out of line. This feature was cured by heating the castings to a cherry red heat and then clamping them on a surface plate. After filling several orders satisfactorily in this manner the customer increased the height of the bosses. With these higher bosses, porosity again appeared and small chills had to be placed in the cope around the two end bosses and the center boss. Use of these additional chills increased the warpage to such an extent that most of the castings crack when an attempt is made to straighten them.

While long distance diagnosis necessarily is liable to error for lack of some possible details, general foundry practice would seem to indicate two alternative solutions for the problem. The first is to continue the present method of making the mold, but bend the pattern in the opposite direction to compensate for the anticipated warpage. Assuming that it is a wood pattern, a number of saw cuts across the face will permit bending the pattern the necessary amount. Since the drag chills are in sections they may be used on the bent pattern. The casting as poured (*Please turn to page* 86)

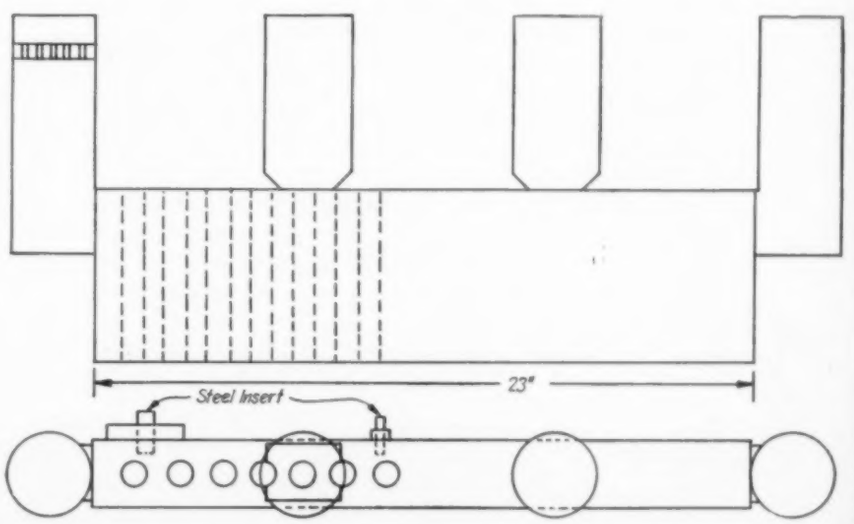
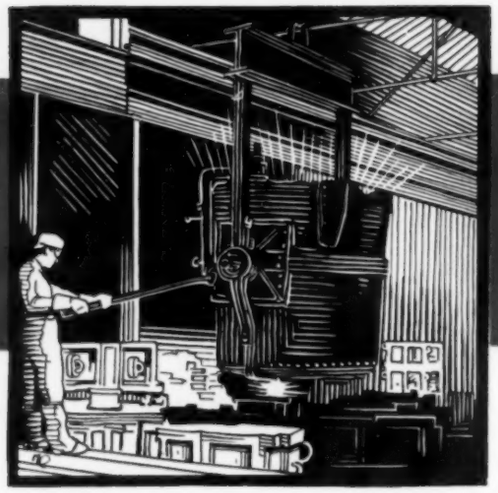


Fig. 2—Proposed method of gating and molding to prevent warpage



Questions and Answers

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Producing Abrasive Surface On Bronze Castings

We will appreciate any information you have available on producing bronze elevator door sills with an abrasive or safety tread surface.

While we are aware that abrasive surfaced or safety tread plates are made with a cast iron back, we do not know whether they can be produced with bronze backs. We believe that the process for producing the former type of plate, which is said to be a proprietary process, depends considerably upon the temperature of the molten metal for its success. Since bronze is poured at temperatures considerably under that used for cast iron, it is quite possible that satisfactory results cannot be obtained.

Essentially, the process of making the cast iron plates consists of making the mold in the regular manner, and then removing the pattern. The face of the mold is sprayed with a solution of water glass (sodium silicate), and then a thin coating of the abrasive which may be silicon carbide or aluminum oxide, sold under various trade names, is placed in position by sieving or screening. The abrasive grain may vary from 12 grit which is approximately 0.08-inch in diameter to 30 grit which is about 0.03-inch in diameter. Then the pattern is placed in position again and pounded lightly or stamped back so that a smooth surface is obtained on the face of the mold. The pattern is removed and the face of the mold again is sprayed with water glass and a second thin coating of abrasive sprayed on.

The pattern again is stamped-back, removed, and the face of the mold thoroughly dried with a torch. Then the mold is closed and the metal poured in. It is our opinion that the abrasive face on the casting results partly from the molten metal penetrating between the grains of the abrasive, and partly through a fusion of the sodium silicate (water glass) and the abrasive. Alternative binders or carriers to hold the abrasive to the face are thin clay solutions or molasses water.

Since penetration of the metal between the abrasive grains is necessary to secure an adherent face, it may be advisable to add more than the usual amount of phosphorus in the case of the bronze sill, and form what might be termed a phosphor-bronze. That material is extremely fluid and searching, and flows into the minutest crevices.

Ordinarily, the greatest care must be employed in blacking the mold face and cores so that phosphor-bronze will not penetrate between the sand grains and result in a rough surface on the casting. However, that peculiar characteristic will be of advantage as the penetration will insure a tightly adhering abrasive face on the casting. Another point to be kept in mind is to pour the castings at as high a temperature as possible without running into other difficulties engendered by excessive pouring temperatures.

Has Porosity Troubles With Furnace Water Coil

We are making circular water coils for insertion in furnaces from a mixture composed of 10 copper sheeting, 5 lead and 5 zinc. We are having trouble with porosity around the edges and the cross section in addition to leakage around the chaplets. The casting section is about 3/16-inch, and as it is a factor in cost we do not want to increase it. The core contains a gas channel and is pasted.

Evidently, there is a mistake in the figures given for the mixture which shows 50 per cent copper, 25 per cent lead and 25 per cent zinc. Probably, you intended it to be 100 pounds of copper sheeting with 5

pounds each of lead and zinc which would probably indicate a final analysis of of 92.5 per cent copper, 4.5 per cent lead and 3 per cent zinc. Presumably the lead is added to aid in machining operations on the tapped water inlets and outlets.

Without having a piece of the casting for examination it is difficult to state definitely what is causing the trouble. The trouble with the chaplets which presumably are copper, or should be, is that they are not clean and dry, or that the metal is not poured hot enough to insure fusion between the chaplet and the metal. The porosity may arise from the pasted joint in the core, especially if the paste is not dried properly before setting the core in the mold. Incidentally, there seems to be no valid reason why the cores cannot be booked green and then dried as one piece, rather than making two halves, drying and then pasting together.

Porosity may also be caused by improper melting arising from insufficient oxygen to promote complete combustion, or allowing the hot metal to stew in the furnace. Under such conditions the metal absorbs gas which is partially ejected during solidification, and leaves the metal permeated with pinholes. Melt your metal fast and hot. While the amount of zinc added to your alloy should give it fluidity, it may be advisable to add 2 ounces of 15 per cent phosphor-copper per 100 pounds of metal.

Aluminum In Bushings May Come From Scrap

We melt bronze bushing metal in a stationary gas fired crucible furnace using a select grade of scrap metal and keeping the pot covered during melting. In spite of our best attention, we have at times experienced trouble with aluminum in the metal causing gas holes and cracks in the finished bushings. Please advise us as to the best procedure to use in melting practice and the kind of flux to use which will flux out aluminum from the metal before pouring. We lift our crucibles out of the furnace and use yellow stick phosphorus and a proprietary flux for red brass, stirring well. We can readily tell when a pot of metal has aluminum in it before pouring by the film that forms on the surface of the molten metal. We would appreciate your suggestions in eliminating this trouble.

Your question does not state the analysis of the metal that you are attempting to produce. We are, therefore, ignorant as to whether you are trying to make a bronze bushing or a yellow brass bushing. We realize that yellow brass is not suitable for bearing purposes where actual bearing wear is of any moment; but there are many places where bearing wear is not the important factor, and therefore, yellow brass is used in bushings.

For yellow brass castings, a little aluminum is desirable provided there is not too large a quantity. For red brass or bronze castings the aluminum is detrimental. Its detrimental effect is debated from the standpoint of its interference of wear or effect upon the surface of the casting. It is almost impossible to flux aluminum from the bronzes if it is present in any appreciable percentage without the loss of other valuable elements, such as tin.

The most practical way to make bushings from scrap is to be sure to use scrap that is free from aluminum and approximates the analysis desired. To use scrap that varies widely in analysis and occasionally contains some aluminum, means that aluminum is bound to go into the melt. The only cure for this is to put it through a smelting process and produce ingot metal. Then take the ingot metal, analyze it, and add thereto the necessary copper, tin, lead or zinc that will bring it to the desired analysis. This obviously is much more expensive than to buy the ingot from competent smelters who smelt the metal on a large scale and thus keep the cost very low, and who protect their reputation by delivering only a high quality ingot which insures the foundry against troubles arising from the presence of aluminum.

Your procedure in melting is apparently good. However, the presence of stick phosphorus is not desirable and is hazardous. That hazard can be avoided by the use of phosphor copper in place of stick phosphorus. We would point out that phosphorus will not eliminate aluminum. To eliminate aluminum some oxidizing reagent must be added such as copper oxide or barium sulphate or the like. Such material gives off oxygen. This oxygen combines with the aluminum and forms aluminum oxide, which floats to the surface and is removed with the slag. However, this oxidation also oxidizes the tin, lead and zinc in the alloy and consequently must be used skillfully and allowance made for the loss of the other elements as well.

After the oxidizing process has continued to a sufficient degree to remove the aluminum, a deoxidizing process must then take place which would require the presence of phosphor copper, charcoal, or some other reducing agent so that the reducible oxides may be converted back to metallic elements and produce the required clean alloy. This is a smelting process and one that is not economically done in the small units common to the foundry. Many foundrymen think they are saving money by attempting to do this in their plants in crucibles, but buying the ingots from smelters who handle this scrap has proven much more economical.

You may be able to make satisfactory foundry products from scrap if you have someone who carefully selects the right kind of scrap and only melt that for the production of castings. Those pieces of scrap that are of doubtful character or definitely carry aluminum should be sold to a smelter.

Gating castings is also an important step in insuring sound and clean products. Possibly some of the defects you have are caused by the agitation of the alloy in passing through the gates to the castings. Gating should also be that which will produce the least amount of agitation in the metal and insure a quiet flow of metal to the mold; at the same time delivering metal at points in the castings that will provide the hottest metal at these points where cooling occurs last.

Castings Must Be Polished

Can you supply us with analyses of red or yellow brass which will run free, cast smooth and take a good polish? The alloy is to be chromium plated.

There are a number of alloys available that should meet your requirements of pouring and casting qualities, if reasonable care is taken in melting the alloys to see that they do not absorb gases in the furnace, and in molding. You can try any of the following: Lead, 4.25 to 5.75 per cent; tin, 3.25 to 4.75 per cent; zinc, 9 to 11 per cent, and copper, remainder. Lead, 7 to 9 per cent; tin, 2.50 to 3.50 per cent; zinc, 8.50 to 11.50 per cent, and copper, remainder. Copper, 70 to 75 per cent; lead, 1 to 4 per cent; tin, 2 per cent maximum, and zinc, remainder. Copper, 65 to 70 per cent; lead, 1 to 4 per cent; tin, 1.50 per cent maximum, and zinc, remainder. Copper, 64 to 67 per cent; lead, 1 to 3 per cent; tin, 1 per cent maximum, and zinc, remainder. The first two of the alloys mentioned are reddish yellow in color while the others are yellow brass.

Wants To Make Pig Iron From Scrap

We have been advised of a process, being used in England, to make pig iron out of scrap rather than out of ore. It was claimed that pig iron made in this manner can be produced at a much lower cost than regular pig iron from ore, and more so, that it has qualities in it making it stronger and better than the regular mixture using iron ore etc.

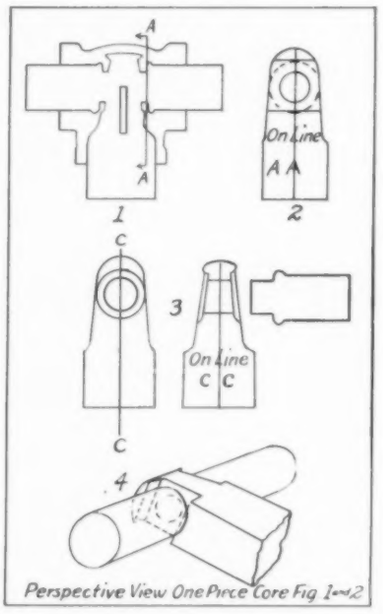
Presumably the process referred to is that employed by one English pig iron producer in making what is known as special pig iron. However, as near as we can recall — some pig iron (molten direct from the blast furnaces) is poured into a rotary type powdered coal melting unit containing steel scrap.

The steel scrap lowers the total carbon content and the phosphorus, and the high temperature prevalent in the furnace tends to dissolve all the carbon so that when the final pig iron is obtained — the total carbon is low and the graphite is in a comparatively finely divided state which is said to persist even after remelting in the cupola. Various ferroalloys such as ferrosilicon and ferromanganese are added in the rotary furnace if required. Nickel and chromium also are added.

We do not believe that the pig iron can be made from scrap more cheaply than from ore unless it could be done on an extremely large scale. While scrap might be relatively cheap today — it may be expensive tomorrow — particularly when such a process as mentioned became commercial on a large scale.

On a small scale you might try a duplexing process using a cupola with an air furnace, electric furnace or rotary powdered coal fired furnace. The raw materials are melted in the cupola with just enough coke to melt it rapidly with fused sodium carbonate to reduce sulphur — and the molten metal transfered to the other furnace where it is refined and at the same time raised to a high temperature. In this furnace scrap steel could be added with other ferroalloys to give the desired composition also the sulphur could be reduced further if desired.

Then the metal should be poured into castings. If poured into pigs and then remelted — additional cost would be added.



Figs. 1 and 2 (Above)—One piece core. Fig. 3 (Center)—Three piece core. Fig. 4 (Below)—Perspective view of one piece core

Make Valve Core In Two Parts

We are forwarding a small brass valve and will appreciate your opinion on the best method for making the core. Our foundry foreman favors the idea of making the core in one piece. To do this it will be necessary to place loose half rings in the corebox, two in the top half and two in the bottom half. These rings to be drawn laterally, each pair after each half of the corebox has been removed.

Generally speaking a one piece core is preferable to one made in two or more pieces, but in the present instance we do not see how you are going to hold the rings in the corebox. If you turn a recess in the box for a seat, the thickness of the rings will be increased to a point where it will be impossible to draw them out in the space in the core. Also, even if there were room, a great deal of time would be wasted on each core.

Two alternative methods are presented for your consideration, one for a one piece core, the other for a core in three pieces. The first method involves a slight redesign of the pattern, or rather the casting. Instead of a ring, carry the thickness of metal all the way across the core as shown in Fig. 2. With this arrangement the core is made in a split box, each half of which may be removed readily from the core.

In the second method shown in Fig. 3 two coreboxes are required, one split through the center for the main part of the core, the other a solid box for making the side branches. Both these boxes may be made as multiple or gang boxes. The cores remain on the plate sitting on their own prints. In this second method the corebox is split on a line parallel to the two branches instead of through the branches as is in the first instance. The box is rammed full of sand through the open end. Then it is inverted on the plate, parted and removed sideways leaving the core sitting on the print. After the cores are dried the small ends of the branch cores are inserted in the corresponding holes in the center core.

Anchoring End of Bar in Weight

One of our castings is a weight on the end of a heavy steel bar. With what material should we coat the end of the bar to insure a tight joint?

Sodium silicate, commonly known as water glass is the material usually employed in coating the ends of steel spokes and other bars of a similar character in which the end is surrounded by cast metal. In some instances the end of the insert is coated with molten tin. However, this treatment generally only is necessary where the volume of metal is not sufficient to fuse slightly the end of the bar. In your particular instance you should secure a tight fit by grinding the immersed part of the bar bright and then arranging the gate so that the stream of metal falls directly on the bar. If the bar has to remain in the mold for an appreciable length of time before pouring it is advisable to cover the treated part with a light film of oil, tar, chalk, or red paint, or any other material to prevent condensation of moisture.

Charles E. Hoyt

A.F.A. Broadens Its Scope of Activities

Dan M. Avey

AS THE first step in a program of broadening both its scope of activities and its responsibilities as a national association of the foundry industry, the executive committee of the board of directors of the American Foundrymen's association, at a meeting held in Chicago, Dec. 4, elected C. E. Hoyt, for the past 18 years executive secretary-treasurer, to the position of executive vice president in accordance with the recent revision of the by-laws creating that office.

At the same meeting, Dan M. Avey, formerly vice president and director of the Penton Publishing Co. and editor of THE FOUNDRY, was elected secretary-treasurer.

In his new position, Mr. Hoyt will continue as the executive officer of the association, directing efforts toward broadening the field of service of the A. F. A.

Mr. Avey's election to the office of secretary-treasurer not only will strengthen the official staff but will make available to the foundry industry through the A. F. A., the services of one who, as editor of THE FOUNDRY and an active participant for many years in association work, has an intelligent understanding of the problems and ramifications of the industry, a rare executive ability, and the determination to help the foundry industry to meet and solve its problems, and move forward.

All Branches Co-operate

This broadening of the organization, leading to new fields of activities, is the culmination of a series of developments emanating from a joint meeting of directors and members of the advisory board at the annual convention in Detroit last May. This meeting was devoted to a discussion of methods for broadening the scope and responsibilities of the association, resulting in action and authorization at the annual business meeting for the appointment of a special committee on policies and activities composed of a representative from each of the four branches of the industry and one from the foundry equipment industry.

A progress report of this committee, presented at the annual meeting of the board of directors, July 23, contained the recommendation that the by-laws of the association be amended to provide for the office of executive vice president, thereby increasing the personnel of the official staff.

A Family Foundryman

Charles Edgar Hoyt, comes from a family of foundrymen, his father and three uncles having learned the molders trade in the days when a 7-year apprenticeship was required. During vacations, he worked in the foundry and, on finishing school, was associated with his father for a time in operating a jobbing and machine shop.

Then he accepted a position with Michigan State college, East Lansing, Mich., in charge of pattern shop and foundry work. He held this position for 3½ years, resigning to accept a position on the engineering faculty of Lewis institute, Chicago.

On locating in Chicago, Mr. Hoyt took an active part in association work, first as a member of the Western Foundrymen's association, than as secretary-treasurer of the Chicago Foundry Foremen's association. He later was elected secretary of the Associated Foundry Foremen of America. As secretary of the Chicago association, Mr. Hoyt staged two conventions and exhibits at Lewis institute which attracted the attention of members of the Foundry Supply association, resulting in his election as secretary and manager of exhibits of that association and its successor, the Foundry and Machine Exhibition Co.

When the A. F. A. was incorporated in 1916, Mr. Hoyt was one of the signers of the application for a charter and was elected a director, in which capacity he served for several years. At the time of its incorporation, A. F. A. also took over the exhibition of foundry equipment and supplies, and Mr. Hoyt was elected manager of exhibits. Mr. Hoyt has continued in that capacity since, and will retain that position under the new set-up of the organization.

When the association established a war service office in 1917 in Washington in response to a government request, Mr. Hoyt was placed in charge, resigning from the faculty of Lewis institute, which position he had held during the years of association activities.

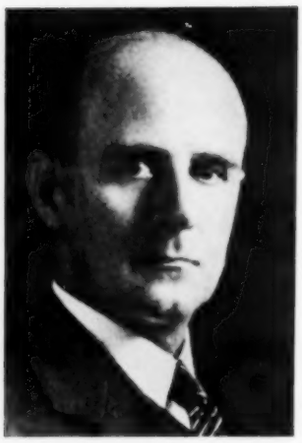
At the 1918 convention he was elected secretary-treasurer of A. F. A., succeeding the late A. O. Backert who resigned to accept the presidency. In 1926 Mr. Hoyt was made executive secretary-treasurer which position he held until his recent election to the executive vice presidency.

Knows Association Work

Dan M. Avey long has been identified with the work of the American Foundrymen's association. He has served as chairman, member, or representative on many important committees, including those on international relations, program and papers, and the joint committee on standardization of foundry equipment and supplies. He was a director of the association in 1931 and 1932, vice president in 1933, and served two terms as president in 1934 and 1935. Mr. Avey also has been active in the Foundry Equipment Manufacturers' association, having served as its secretary for a number of years. He is a member of the American Foundrymen's association, the American Society for Testing Materials, the Institute of British Foundrymen, the Association Technique de Fonderie de France and the International Association for Testing Materials.

(*Concluded on page* 86)

W. Paul Eddy Jr.



O. W. Ellis

Thomas J. Frank

John T. Brown

MEN OF INDUSTRY

W PAUL EDDY JR., who is to prepare the American Foundrymen's association exchange paper for the 1937 meeting of the French Foundry Technical association, is chief metallurgist of the General Motors Truck Corp., Pontiac, Mich. Born in 1899 in Syracuse, N. Y., he received his bachelor of science degree in chemical engineering from Syracuse university in 1922.

For 2 years following his graduation Mr. Eddy was a chemist at the Crucible Steel Co. of America, Syracuse. In 1924 he went to the Geometric Tool Co. as assistant metallurgist and was made chief metallurgist in 1925. In 1928 Mr. Eddy returned to Syracuse as assistant metallurgist of the General Motors Chapin division, General Motors Corp., and in 1930 became chief metallurgist of the Brown-Lipe-Truck Corp. He is the author of many technical papers, a member of the American Society for Metals, American Society for Testing Materials and the British Institute of Metals.

♦ ♦ ♦

O. W. ELLIS, who is to present the American Foundrymen's association paper before the Institute of British Foundrymen, is director of research in metallurgy, Ontario Research foundation, Toronto. Born in Swindon, England, he received his technical training at the University of Birmingham, Birmingham, England, graduating with a bachelor of science degree in 1914 and master of science in 1917. From 1905 to 1910, Mr. Ellis served as apprentice for the Great Western railway at Swindon and in 1910 and 1911 he was assistant to the supervisor of apprentices of the Canadian Pacific railway, Montreal, Canada. From 1914 to 1921 he was metallurgist, Royal Ordnance Factories, Woolwich, England. In the latter year, Mr. Ellis returned to Canada to accept a position as assistant professor of metallurgical engineering at the University of Toronto, remaining there until 1925. At this time he was appointed an Industrial Fellow at the Mellon institute, Pittsburgh. From 1926 to 1929, he held a position as research metallurgist, Westinghouse Electric & Mfg. Co., Pittsburgh, and in that year returned to Canada to accept his present position. He is a member of the A.F.A., Institute of Metals, Iron and Steel institute and numerous other organizations and societies.

♦ ♦ ♦

THOMAS J. FRANK, chairman of the Quad-City Chapter of the American Foundrymen's association, is manager of the Davenport, Iowa, plant of the Frank Foundries Corp. Born in Davenport in 1895, Mr. Frank attended the public schools of that city and later enrolled in Iowa State college, from which he was graduated with a bachelor of science degree in chemical engineering. Following graduation, he entered the employ of the Frank Foundries Corp., with which he has been associated ever since. Mr. Frank was one of the organizers of the Quad-City Foundrymen's association which later became the Quad-City Chapter of the A.F.A.

♦ ♦ ♦

FREDERICK SALDITT, export manager of the Harnischfeger Corp., Milwaukee, has been elected a vice president of the company. Mr. Salditt entered the Harnischfeger works as a shop clerk in 1923 and worked through various departments until he became head of the export department 2½ years ago. He will continue to retain supervision of foreign operations. EDWARD SLACKFORD, formerly with the Marion Steam Shovel Co., Marion, O., and more recently engaged in industrial advertising work, has been appointed advertising manager of the company. He succeeds WOODS SANFORD who has resigned to join the sales force of the Chain Belt Co., Milwaukee.

♦ ♦ ♦

JOHN T. BROWN, former works manager of the Chain Belt Co., Milwaukee, has been elected a vice president of the company. Graduating from Yale university in 1925, Mr. Brown became associated with the company that year, in the capacity of a graduate student apprentice. He worked his way through numerous positions to become production manager and ultimately works manager.

♦ ♦ ♦

M. S. GIFFORD recently was appointed gray iron foundry superintendent of the Massey-Harris Co., Batavia, N. Y. Mr. Gifford has been associated with the gray iron industry since his graduation from the University of Wisconsin in 1914. During that time he has been connected with J. I. Case Co., Racine, Wis., the Chicago Hardware Foundry Co., North Chicago, Ill., Sealed Power Corp., Muskegon, Mich., the D. J. Ryan Foundry Co., Ecorse, Mich., General Refrigerator Co., Beloit, Wis., and the Advance Rumely Co., La Porte, Ind. Previous to

(*Concluded on page* 42)

Wm. E. Pratt saves $3.84 a ton cleaning soft iron with their

This Wheelabrator Tum-Blast saves William E. Pratt Mfg. Co., Joliet, Illinois, $11,281.92 annually, over old methods of cleaning soft iron castings.

WHEELABRATOR
(Reg. U. S. Pat. Off.)
TUM-BLASTS

Using a Wheelabrator in your foundry will reduce your cleaning costs comparably.

William E. Pratt Mfg. Company, Joliet, Illinois, investigated the Wheelabrator for replacing sand blast barrels and tumbling mills. This investigation resulted in their purchase of a 36" Wheelabrator Tum-Blast which has been in regular operation since July 1934, part of the time on a two-shift basis.

Prior to the installation of the Wheelabrator, production in the soft iron cleaning department averaged 0.320 tons per man hour at a total cost of $5.28 per ton. An audit prepared on the operation of the Wheelabrator Tum-Blast reveals that production has been increased to 0.955 tons per man hour and the cleaning cost reduced to $1.44 per ton. The results: A saving of $3.84 per ton or 72%. On the basis of present production, this is equivalent to a saving of $36.63 per day or $11,281.92 annually.

The equipment has already paid for itself out of the economical operation brought about through its use. A SECOND Wheelabrator is now in operation showing comparable savings and it also will soon pay for itself.

This is another of the typical installations proving the drastic cleaning cost reductions made possible through the use of the Wheelabrator as applied to the Tum-Blast, Multi-Rotary Table, Cabinet, or automatic production unit.

Investigate the Wheelabrator for your foundry cleaning problem. Write us today for complete information.

Obtain free cleaning cost surveys of these foundries

1. Western Foundry Co.
2. Thos. Devlin Mfg. Co.
3. Dodge Steel Company
4. Quincy Stove Mfg. Co.
5. Milwaukee Mall. & Grey Iron Works
6. Wm. E. Pratt Mfg. Co.
7. A Southwestern Malleable Foundry
8. A Large Automobile Co.

Send for literature and facts about the

WHEELABRATOR
(Reg. U. S. Pat. Off.)

Tum-Blasts Multi-Rotary Tables
Automatic Production Units—Cabinets

Proof justifies your investigation of savings

NIELSEN CERTIFIED PERFORMANCE SURVEYS

WM. E. PRATT MFG. COMPANY

TABLE C

Savings Effected by Wheelabrator Method of Soft Iron Cleaning in Malleable Plant

Unit Costs per ton	
American Wheelabrator Tum-Blast (from Table A)	$1.44 per ton
Former method of milling and sand blasting (from Table B)	5.28
Savings Effected over Former Method	
Saving per ton: ($5.28 - $1.44)	$ 3.84
Saving per day: ($3.84 x 9.54 tons)	36.63
Saving per 3-month period: ($3.84 x 734.5 tons)	2,820.48
Saving per year: ($2,820.48 x 4)	11,281.92
Per cent reduction in cost: ($3.84 ÷ $5.28)	72.7%
Net annual return on investment: ($11,281.92 ÷ $6,553.85)	172%

Equipment pays for itself in approximately 7 months.

AF-71-XX 4-24-35-IN 9

Send for complete survey

The AMERICAN FOUNDRY EQUIPMENT COMPANY
505 Byrkit St., Mishawaka, Indiana

(*Concluded from page* 40)

his present connection, Mr. Gifford was foundry superintendent of the General Refrigerator Co.

• • •

JOHN C. BRYAN has become connected with Foster D. Snell Inc., Brooklyn, N. Y., chemists.

• • •

HARRY G. MOUAT has been appointed representative of the Newark Wire Cloth Co., Newark, N. J., in the Birmingham territory. He will be located in the Martin building.

• • •

FRED N. LOWRY, general superintendent of the Dow Chemical Co., Midland, Mich., has resigned after service for 35 years with the company.

• • •

JOHN N. RICHARDSON, formerly associated with FRANK D. Chase as foundry engineer has established his own foundry consulting practice with offices at 332 South La Salle street, Chicago.

• • •

JAMES WHITING has been appointed Philadelphia district representative of the Stearns Magnetic Mfg. Co., Milwaukee, in charge of its newly-opened office in that city. His headquarters will be at 369 Architects building.

• • •

TOM BARLOW, formerly chief metallurgist of the Ecorse Foundry Co., Ecorse, Mich., has been appointed research metallurgist of the Battelle Memorial institute, Columbus, O. He has been assigned to the division of process metallugy for development work on cast iron.

• • •

PIERCE BOUTIN has been appointed sand foreman at the foundry of Pontiac Motor Co., Pontiac, Mich. Previously he held the same position at the Chevrolet Gray Iron Foundry, Saginaw, Mich. Prior to that he taught high school science and mathematics.

• • •

DAVID S. YOUNGHOLM has been elected a vice president of the Westinghouse Electric & Mfg. Co., Pittsburgh. He will make his headquarters in New York. Joining the organization 27 years ago, his first position was in the engineering department. Ultimately he became vice president of the Westinghouse Lamp Co., Bloomfield, N. J., the position he held until his recent appointment. LELAND D. O'CONNELL has been appointed manager of the Denver office of the company. Born in Audubon, Iowa, Mr. O'Connell has been affiliated with the company since 1919.

• • •

ERNEST T. FISHER, formerly superintendent and assistant manager of the Illinois Foundry Co., Springfield, Ill., has become associated with the Claude B. Schneible Co., Chicago. He will act in the capacity of sales engineer, covering the St. Louis territory. Mr. Fisher was foundry engineer for many years at the East Pittsburgh and Philadelphia plants of the Westinghouse Electric & Mfg. Co.

• • •

JAMES H. HERRON, president of the James H. Herron Co., Cleveland, consulting engineer, was elected

James H. Herron

president of the American Society of Mechanical Engineers at its fifty-seventh annual meeting in New York Nov. 30-Dec. 5. He succeeds W. L. BATT, president, SKF Industries Inc., Philadelphia. Mr. Herron was born in Girard, Pa., and started work at the age of 14 as apprentice with the Sterns Mfg. Co., Erie, Pa. He had been affiliated with the Erie City Iron Works, Erie, the Ingersoll Sargent Drill Co., Easton, Pa., Cambria Steel Co., Johnstown, Pa., Bury Compressor Co., Erie, Motch & Merryweather Machinery Co., Detroit, and Detroit Steel Products Co., before he established his own consulting practice. He is a director of several companies and the author of technical papers on metallurgical subjects.

• • •

JOHN L. YOUNG, service engineer in the sales department of the United Engineering & Foundry Co., Pittsburgh, has been appointed manager of machinery sales for the company. He graduated from the University of Indiana in 1921 and for 14 years was associated with the Timken Roller Bearing Co. He was Pittsburgh district manager for that company and for a year preceding his identification with United Engineering & Foundry Co. was assistant general manager of its industrial division at Canton, O.

• • •

GEORGE H. WEILER recently has become associated with the Vanadium Corp. of America, Eastern railroad division, with headquarters in New York. For a number of years he was sales manager of the American Locomotive Co., New York. Later Mr. Weiler became secretary-manager of the Forging Manufacturer's association, New York. More recently he was connected with the Standard Steel Works Co., Burnham, Pa.

Discuss Molybdenum In Connecticut

Norman F. Tisdale was the principal speaker at the Nov. 20 meeting of the Connecticut Foundrymen's association, held at the Home club, Meriden, Conn. Following dinner, Mr. Tisdale gave a comprehensive and well-received talk on "Molybdenum in Cast Iron." W. J. Maton is president of the association.

Book Review

Advertising People and Copy Slants, by Robert Tinsman, cloth bound, 192 pages, published by the Business Bourse, New York and supplied by THE FOUNDRY, Cleveland for $2.00 plus 15 cents postage

Drawing upon his 29 years' experience as journalist, copywriter, space salesman, business executive and agency head, Mr. Tinsman covers the subject of advertising, its sale and application, interestingly and well. His style is informal, his comments and discussion readable and to the point. The book does not purport to be a text on the subject of advertising but will, because of having been written from the practical aspect, be of interest and value as such. Typical chapters: "Salesmen I Have Known," "Trade and Technical Copy."

The newly-opened American Bureau of Invention with headquarters in the General Motors building, New York, has as its purpose the shortening of the lag now existing between the conception of an idea and its commercial fruition. Ray Gross, engineer and author of books and articles on inventions, is the bureau's director. A permanent exhibition is planned for inventions, apparatus, materials and graphic presentations of facts and information.

OSBORN

MOULDING MACHINES

• You can secure fast, accurate, economical production of uniformly high quality cores with Osborn Rollover Core Machines. These machines assure uniformly rammed cores of maximum strength. Extreme accuracy of the pattern draw and leveling mechanisms of Osborn Rollover Core Machines simplify the production of cores considered difficult to produce by ordinary methods. Regardless of your particular core making requirements, you can select the correct type and size equipment to assure maximum results from the extensive Osborn line of Rollover Core Machines and Core Blowing Machines.

The Osborn Manufacturing Company
5401 HAMILTON AVENUE • CLEVELAND, OHIO, U. S. A.
• Agencies strategically located all over the world •

No. 40 Osborn Rollover Core Machine . . . one type in the extensive group of Osborn machines designed for fast, economical production of uniformly high quality cores.

TIME PROVES VALUES

OSBORN

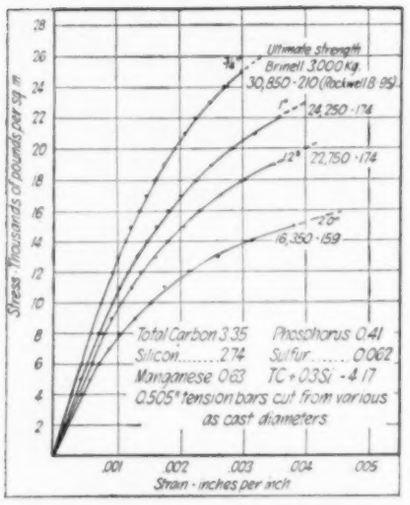


Fig. 132—Tensile stress-strain diagram of a low strength gray iron

Gray Cast Iron

By JOHN W. BOLTON

Chapter XII (Continued)

Strength and Elasticity

MODULUS of elasticity of a material is equal to the stress in pounds per square inch divided by the strain in inches per inch, and is expressed in pounds per square inch. The modulus of elasticity of most steels (within the elastic range) is about 30,000,000 pounds per square inch irrespective of the strength or structure. The modulus of elasticity is a good measure of rigidity.

Due to the curvature of the ordinary stress strain diagram for cast irons, the tangential moduli rarely are determined. These of course vary with the loadings, being much less at higher loadings. The term relative modulus of elasticity is used for the value determined by measuring the change in length per unit of load. This value for any given load, is considerably higher than the tangential modulus, and gives a fair relative measure of the rigidity.

Show Wide Range

The *true* moduli are higher as was shown in the November issue. The relative moduli of elasticity at 25 per cent ultimate strength will range from about 12,000,000 pounds per square inch for irons with about 20,000 pounds per square inch tensile strength to possibly 28,000,000 pounds per square inch for special irons approaching 100,000 pounds per square inch tensile strength.

When permanent set has been removed these values, particularly the lower ones are somewhat increased, the highest ones approaching 30,000,000 pounds per square inch. The elastic moduli of white irons approach 30,000,000 pounds per square inch. The figure 25 per cent of tensile strength has been chosen since at this point permanent set is low, and in cast iron design loads usually are kept well below 25 per cent of the strength of the material.

Thus in the as cast condition the relative rigidity usually is relatively proportional to tensile strength. This is shown in Figs. 132, 133 and 134. Note the greater steepness of the curves for the stronger irons. Structurally the nearer the material approaches steel the closer the modulus is to that of steel. Conversely the more effectively the matrix is broken up by graphite flakes the lower the relative elastic modulus and rigidity. It is important to recall that this continuity is dependent on form and distribution of graphite flakes as well as on their amount.

Since the relative modulus of elasticity is, for practical purposes, apparently dependent on the continuity of the matrix rather than on its nature, and the *tensile strength*, while in most cases mostly dependent on the continuity of the matrix also is in some degree dependent on its *nature*, it follows that the relative moduli of elasticity of gray irons are not in all cases directly proportional to tensile strength. As might be expected, variations in the ratio of *tensile strength* to rigidity are most frequent in irons of other than pearlitic matrix.

Deformation in gray irons has been shown to consist of both elastic and plastic components. It is known that ductile materials like steel if loaded for long periods will fail at stresses much below the tensile strength as determined in short time testing. Test specimens *neck down* and lose maximum total load carrying ability. Cast iron in tension does not *neck down* or deform much in cross section, even at the breaking load. Creep tests are used to determine the maximum loads which can be sustained over long periods of time. In such tests the specimens are loaded to predetermined stress intensities and allowed to so remain for long periods of time—say 1000 hours or more. Extensions are measured by high precision extensometric devices. If continued extension of a specimen observed the material is said to creep or flow under the load. If no extension is observed the material is considered to be within its limiting creep strength.

As shown by the author in Fig. 135—*Symposium On Cast Iron*, 1933—irons *A* and *B* sustained loads of 14,090 pounds per square inch and 34,960 pounds per square inch respectively for long periods with no continued extensions. The original strengths of companion bars were 17,600 and 43,700 pounds per square inch. Thus the specimens had creep strengths equal to or in excess of 80 per cent of their expected short time tensile strengths. We may conclude that the long time static or creep strength of gray iron approaches the test value determined in the ordinary short time test and that yield point and tensile strength are practically the same, once *set* is removed.

Fracture Follows Flakes

Fracture in gray iron follows along the graphite flakes, as shown in the July issue in Figs. 107 and 108 and through the matrix between flake groupings. The fracture

(*Concluded on page* 47)

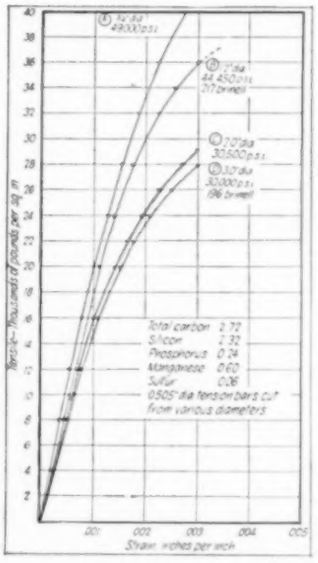

Total carbon 3.72
Silicon 1.32
Phosphorus 0.24
Manganese 0.60
Sulfur 0.06
0.505" dia tension bars cut from various diameters
Tensile - Thousands of pounds per sq. in.
Strain - inches per inch

Fig. 133—Tensile stress-strain diagram of a gray cast iron cast in bars of different diameters, but using a 0.505-inch bar turned down from the original

What IS High Cycle Anyway?

HERE'S THE ANSWER

A As applied to your daily production problems, High Cycle is the adaption of 180-cycle current to portable electric tools, giving them several distinct advantages over Universal-Motored tools on production work.

Q What are the advantages of high cycle tools?

A There are three which you will quickly recognize: 1. Less weight per unit of power; that means less operator fatigue. 2. Speed maintained under load; that means better work and faster production schedules. 3. Induction type motors; that means less "time out" for repairs and lower maintenance cost per tool.

Q To what extent do high cycle tools maintain speed under load?

A The High Cycle Motor registers only a 20% decrease in speed between no-load and stall points, instead of the steady decrease up to 60% usually registered by a Universal Motor. This is particularly important on abrasive tools like sanders and grinders, because a decrease in the speed of the tool results in an additional decrease in the grinding efficiency of the abrasive and a corresponding increase in the time necessary to complete the operation.

Q Why and how do high cycle tools reduce production Costs?

A Delivering more power per pound of weight, and maintaining constant speed under load, High Cycle Tools enable the operator to turn out more work, in less time, with less fatigue. Savings in costs—amounting to as much as 25%, 30% or 35% per operation—are not unusual when High Cycle Tools replace Universal Tools on the production line.

Q How do high cycle tools reduce "time out" for repairs?

A The High Cycle Motor has no commutator, brushes, armature windings, or other electrical connections between the rotor and stator—thereby eliminating the causes of 80% of the breakdowns and repair "recesses" usual with Universal Tools.

Q What types of plants should install high cycle tools?

A Experience has shown that almost any plant which uses ten or more Universal or Compressed Air Tools for production work can effect important savings by replacing them with High Cycle Tools. In some cases, worth-while economies have been effected by replacing only one or two Universal or Compressed Air Tools with High Cycle Tools.

Q From what source is high cycle current available?

A The necessary 3-phase, 180-cycle current is easily obtained by installing a frequency changer or a motor generator set.

Q What tools are available for use with high cycle current?

A Most types of the famous Black & Decker Universal Tools, which have been extensively used in industry for years, also are available with High Cycle Motors. The Black & Decker High Cycle line includes Drills, Reamers, Screw Drivers, Nut Runners, Tappers, Stud Setters, Portable Sanders, Portable Grinders and Die Grinders.

Q How can I find out whether high cycle tools will reduce my costs?

A Black & Decker's High Cycle Engineers will be glad to make a study of your production operations and give you a report on the economies which can be effected through the use of High Cycle, without cost or obligation on your part. For further information and catalog, write to: Black & Decker-Van Dorn, High Cycle Division, 742 Pennsylvania Ave., Towson, Md.

BLACK & DECKER -VAN DORN High Cycle TOOLS

Made by the World's Largest Manufacturers of Portable Electric Tools

SPO offers a complete line of molding machines of improved design and rugged construction meeting present day requirements of dependability and high production.

★

SPO FEATURES

- GREATER impact of jolt definitely reducing the time required to ram the mold.
- EXTRA long squeeze piston of one common diameter insures long operating life and continuous accurate pattern draw.
- NON-LEAK quick-acting diaphragm air clamps to clamp bottom board to the mold.
- COMPLETELY SHIELDS squeeze piston and all other working parts from sand and grit.

★

SPO Engineers will gladly call and discuss your molding machine problems.

★ ★

SPO Incorporated

extends best wishes for a 1937 of increased good business...

To our many customers who have found that their equipment dollars *do go farther and come back quicker with SPO Molding Machines.*

To the many foundries who, during 1937, will give audience to SPO Engineers available for the discussion of their molding machine problems.

SPO Incorporated

Manufacturers of a Complete Line of Molding Machines and Vibrators

EAST 61st ST. AND WATERMAN AVE., CLEVELAND, OHIO

★

YOUR EQUIPMENT DOLLARS GO FURTHER AND COME BACK QUICKER WITH SPO MOLDING MACHINES

★ ★

(*Concluded from page* 44)

through the matrix usually passes through the shortest line between graphite flake groupings. The tracture line through the pearlitic portion of the matrix may be intercrystalline or transcrystalline—any fracture line usually shows both types as depicted in Fig. 109 in the July issue.

Steadite may be fractured as shown in Fig. 110 in the July issue. To appreciate the real way graphite flakes destroy the continuity of the matrix these should be considered from the three dimensional viewpoint. That is the whorl form, for example, is roughly spherical if three dimensions are considered. This spherical formation has many flakes radiating from its center and has negligible continuity on any plane passing through its center. The real continuity of the matrix depends on the distances between adjacent spheres. Intelligent interpretation of micrographs of unetched gray irons depends in large degree on ability to discern effective continuity.

Recapitulating, the tensile strength of gray iron depends on (a) degree of continuity of the matrix (b) nature of the matrix (c) soundness and freedom from internal stress of the casting.

Degree of continuity of the matrix is dependent on the amount, size and distribution of graphite flakes. Amount of graphite depends on the total carbon content and on the percentage of combined carbon. In many foundry irons the matrix normally is pearlitic, and the combined carbon will vary not over about 0.30 per cent. Yet total combined carbon may be as high as 3.80 per cent or as low as 2.50 per cent. Thus the higher carbon irons usually are weaker. Amount of combined carbon is influenced by nature of the stock, melting operation, silicon content, cooling rate and other factors. With lower combined carbon not only is the matrix weaker, but with given total carbon the graphite content will be greater. Size of graphite flakes depends principally on their amount and on the cooling rate. Distribution of graphite flakes bears a direct relationship to the position of the alloy in the iron carbon diagram.

Leaving steadite and inclusions out of consideration, the nature of the matrix depends on the amount and condition of the combined carbon. If the amount is low, free ferrite is found and, other factors being equal, this component exerts a weakening influence. Strengths of effectively eutectoid matrices vary within wide limits, depending on general grain size and the condition of the pearlite, sorbite, troostite or martensite, as the case may be.

It is suggested that the reader review the sections on structure and on the effects of the elements, where the relationships of structure to strength are explained in greater detail. The author cannot emphasize too strongly that soundness and freedom from internal stresses are factors which may overshadow considerations of composition and structure. Careful design and good foundry practice are as essential as good metal.

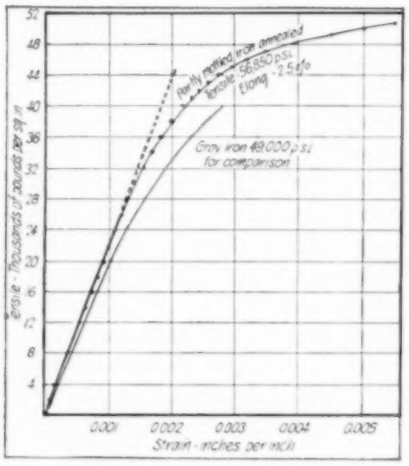


Fig. 134—Tensile stress-strain diagram of a partly mottled iron which has been annealed

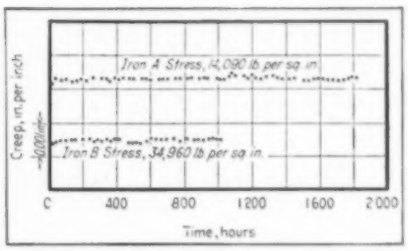


Fig. 135—Creep tests on cast iron at 100 degrees Fahr.

Bolton Articles In Book Form

ALL who have followed carefully this series of articles by John W. Bolton will be interested to know that it will be available in book form within the next few weeks under the title "Gray Cast Iron." The new book will sell for $5 plus 15 cents postage, and will contain approximately 400 pages and 262 illustrations. In addition to the extensive material that has been presented in the pages of The Foundry, the new book will present a comprehensive section on general manufacture of gray iron and chapters on dynamic strength and elasticity, machinability and wear, effect of temperature on engineering properties, corrosion, and specifications. This is the first complete book on the subject of gray iron ever published,

The new book, "Gray Cast Iron," by John W. Bolton may be purchased through the Book Department, The Foundry, Penton building, Cleveland.

Fifteen years ago most commercial gray irons had tensile strengths from 18,000 to 30,000 pounds per square inch. Irons above 40,000 pounds per square inch were rare and few tensile strengths above 50,000 pounds per square inch had been recorded. Practically all American testing was based on arbitration bars 1.25 inches diameter and 15 inches long. Generally, tests determined transverse strength. Today one can get irons of almost any tensile strength up to 100,000 or 110,000 pounds per square inch. The American Society for Testing Materials specifications which will be covered in detail in a later section, cover seven classes of gray iron based upon tensile strength running from 20,000 pounds per square inch minimum to 60,000 pounds per square inch minimum. While absolute limits cannot be given, the highest strengths attainable in small or medium sections, are about 75,000 pounds per square inch as cast, and up to about 125,000 pounds per square inch in special heat treated irons. For heavy sections 50,000 pounds per square inch or slightly above is about the practical maximum. Heavy sections are not amenable to the treatments used to produce the ultimate maximum in strength.

While there has been a general increase in the tensile strengths of gray irons as used in this country, the general adoption of the higher strengths classes, over 40,000 pounds per square inch, is not justified economically. Such materials cost more to manufacture, both in the foundry and machine shop. Where weight is not a paramount consideration, irons in the 25,000-35,000 pounds per square inch range will be used widely and properly for many years.

A newly developed oil-base paint is claimed to require no sizing or washing down of a calcimine surface, prior to application. It is available in three light colors and can be tinted. The manufacturer states that one coat is sufficient for complete coverage over rough, porous or water-stained surfaces.

Shows Consumption of Scrap

Bureau of Mines Conducts Survey of Foundries, Blast Furnaces and Steel Works

By RICHARD J. LUND and H. W. DAVIS

THE large importance of ferrous scrap as a basic raw material in the iron and steel industry is illustrated by the industrial consumption of 26,415,000 gross tons of that material in the United States in 1935, compared with 20,505,000 tons of pig iron, according to a survey recently completed by the United States bureau of mines. The total scrap figure includes almost equal proportions of home or plant scrap and purchased scrap, the tonnage of the former amounting to 13,347,000 tons and of the latter 13,069,000 tons. Even excluding the home scrap—comprising largely recycled material—the tonnage of purchased scrap in 1935 still amounted to no less than 72 per cent of the iron content of the total iron ore consumed in blast furnaces, indicating the conservational aspects involved in the collection and use of scrap iron and steel. Although information on consumption of these materials was not received from all consumers, the compilations include plants absorbing about 98 per cent of the total ferrous scrap and pig iron in uses which involve remelting of the scrap.

Defines Scrap Used

In this study the term *home* or *plant* scrap refers to scrap produced at the plant of the establishment reporting, including (1) new scrap such as spills, risers, skulls, croppings, mill scale, cinder, etc., and (2) old scrap (any items of equipment discarded after actual use). The term *purchased* scrap includes both purchased material and scrap transferred from other plants under the same corporate control, as well as scrap received under exchange contracts or conversion agreements. No doubt the largest proportion of home scrap consumed consists of recycled new material.

Scrap consumption centered in the great steel-making districts in Ohio, Pennsylvania, Indiana and Illinois. These states consumed, respectively, 24, 24, 11, and 9 per cent of the total home scrap; of the total purchased scrap they absorbed 23, 19, 10, and 9 per cent, respectively; and of the total pig iron they used 25, 26, 12, and 9 per cent respectively. Thus, the two states of Ohio and Pennsylvania, producing some 53 per cent of the country's steel in 1935, consumed almost one-half of the total scrap and over one-half of the pig iron absorbed in that year.

The practice of increasing the proportion of purchased scrap in the total scrap and pig iron part of the charge in areas not enjoying easy access to pig iron supplies is shown by the fact that in the Southwestern district (Arkansas, Oklahoma, Louisiana, and Texas) the per cent of purchased scrap to total scrap plus pig iron was 74 per cent; in the Pacific Coast district (Alaska, Oregon, Washington, and California) it was 59 per cent; and in New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) it was 51 per cent.

In other districts, each including at least one important pig iron producing area, the percentages were markedly lower. In the Middle Atlantic district (Delaware, New Jersey, New York, and Pennsylvania) the proportion of purchased scrap in the total scrap plus pig iron part of the charge was lowest (24 per cent); the Southeastern district (south of the Ohio River and east of the Mississippi) and North Central district (Lake and Prairie states) were next (28 per cent each); followed by the Rocky Mountain district (31 per cent). Judging from the number of operators reporting no pig iron consumption, some furnaces of various types operate all year on nothing but scrap, aside from fuel, fluxes, and frequently some ferroalloys. A total of 488 operators were in this category, comprising 385 cupola operations, 91 electric-steel, 6 air furnaces, 5 open-hearth furnaces, and 1 bessemer converter operation.

Consumption of ferrous scrap and pig iron in different types of furnaces is shown in the accompanying table and chart. Almost three-fourths of the total scrap consumption took place in open-hearth furnaces; cupolas consumed about 16 per cent—a total in these two types of 88 per cent. The proportion of purchased scrap to total scrap plus pig consumption was highest in electric-steel furnaces, where it was 48 per cent; next in crucible furnaces (43 per cent); then in cupolas (33 per cent), open-hearth furnaces (29 per cent), air furnaces (23 per cent), and puddling furnaces (21 per cent). Finally, in bessemer converters it

(*Concluded on page* 50)

Consumption of Ferrous Scrap and Pig

By Type of Furnace, 1935

Type of furnace	No. active plants reporting	Scrap, Gross tons — Home	Scrap, Gross tons — Purchased	Scrap, Gross tons — Total	Pig Iron, Gross tons
Open hearth	127	9,589,017	9,530,610	19,119,627	13,944,239
Bessemer	30	212,862	6,452	219,314	3,542,719
Electric	217	464,783	450,776	915,559	33,186
Cupola	2,287	1,916,835	2,241,788	4,158,623	2,675,827
Air	115	278,140	168,103	446,243	295,008
Crucible	10	244	609	853	566
Puddling	5	1,371	4,020	5,391	13,492
Blast	67	883,500	666,220	1,549,720	.....
	*2,858	13,346,752	13,068,578	26,415,330	†20,505,037

*Where two or more separate departments, such as blast furnace department, open-hearth department, foundry department, etc., are located at the same place and are operated by one establishment, each of these departments appears as a plant in the total figure.

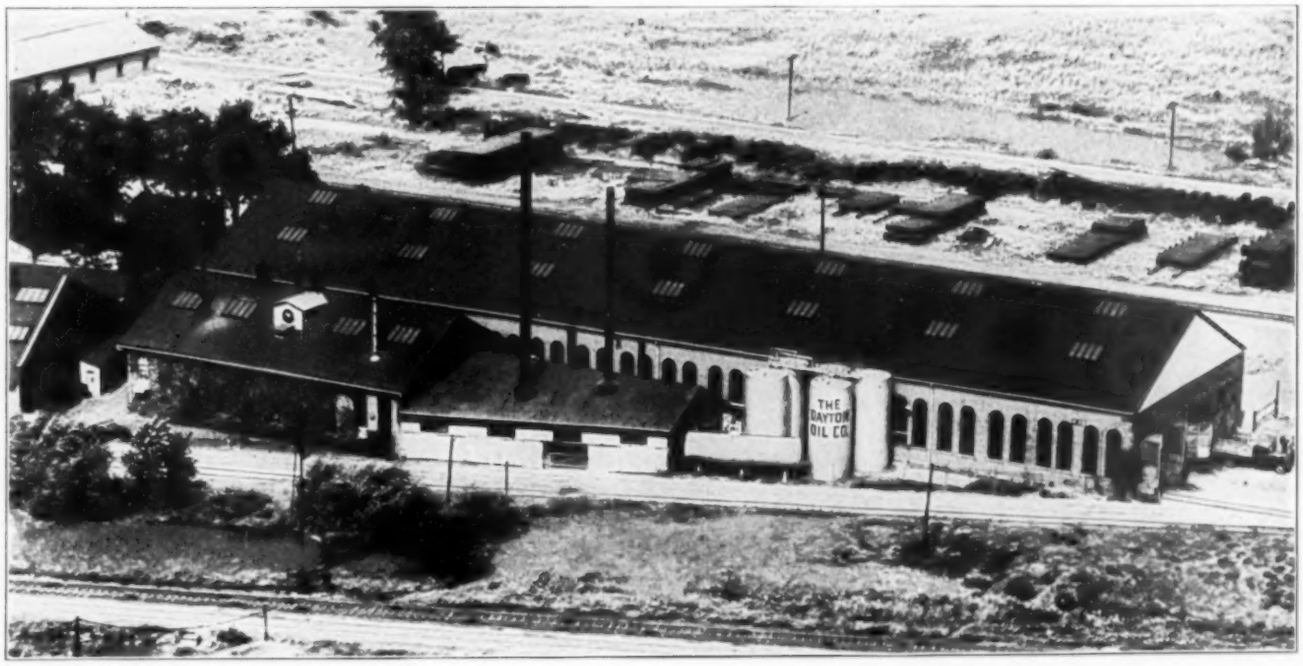
†In addition 115,426 tons were reported consumed in direct castings.

MERRY CHRISTMAS

Quick Baking Time—Lower Baking Costs—Higher Production

—and A Happy, Prosperous 1937

The DAYTON OIL CO.
Dayton, Ohio



(*Concluded from page* 48)

was almost negligible (0.17 per cent).

In submitting these results the bureau of mines seeks to fill a gap which has existed heretofore in metalliferous statistics due to the lack of adequate official figures on consumption of ferrous scrap on an annual basis. This type of information is designed to meet the needs of: (1) Consumers of ferrous scrap, including operators of blast furnaces, steel mills, ferrous foundries, and rolling mills; (2) marketers of scrap iron and steel, including large brokers who sell, and dealers who collect, prepare, and sell the material; (3) large scrap producers; (4) producers of iron ore, with which scrap competes indirectly; and (5) other individuals and agencies interested in more general economic analysis, since the scrap market has repeatedly been cited as one of the most sensitive of all industrial barometers. To correlate ferrous scrap consumption more closely with pig iron consumption, figures for the latter also were obtained.

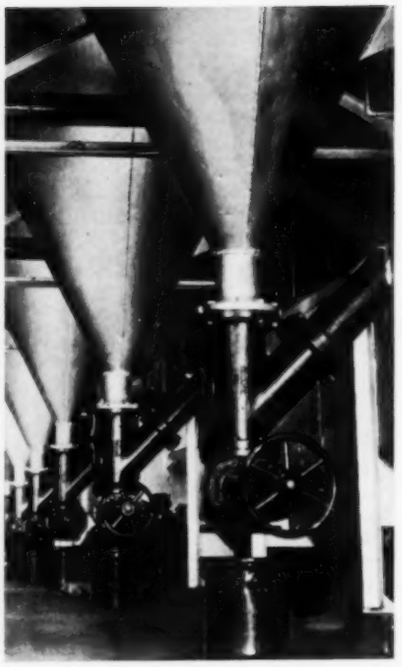
The bureau appreciates that its first efforts in this field may not meet all expectations; but it hopes to develop gradually through suggestions, advice, and criticism from the industrial groups most interested in a type of analysis that will be in close accord with technical processes and best meet the needs of all groups vitally interested in supplies and use of ferrous scrap. Comment and suggestions from the trade regarding improvements to be desired will be appreciated.

A more complete discussion of scrap iron and steel consumption in 1935, together with detailed figures, is given in report of investigations 3329 of the bureau of mines. Readers of THE FOUNDRY may secure the detailed report by addressing the director, United States bureau of mines, Washington.

Foundry Cleans Air By Washing

An air-cleaning system which handles 750,000 cubic feet of air per minute is in use at the foundries of the Dodge division of Chrysler Corp., Detroit. The installation, said to have cost over a quarter million dollars, is described as one of the most modern plants of its type.

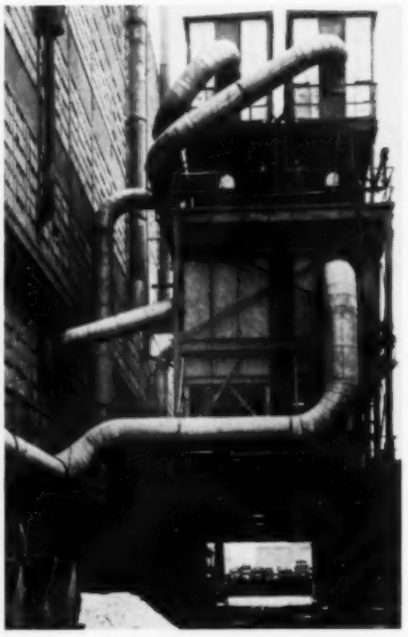
In its layout, the plant includes a series of booths, hoods, enclosures, and openings placed where excessive dust or smoke are produced in foundry operations. These openings connect with sheet metal ducts leading to separators and collectors.



Dust and dirt are separated from the air with the aid of constantly flowing water

Here the air is passed through water which picks up the dust and conveys it to a pumping system.

The final destination of the dust-carrying water is a battery of dewatering machines by which the solids are separated from the liquids. The water is returned to circulation in the air-cleansing system while the solids, in the form of a heavy paste, are dumped into railroad cars for removal from the premises. In withdrawing the air for washing, 52 powerful suction fans are used, requiring 1200 horsepower for their operation.



Outside view of one of the wash towers forming part of the cleaning system

The efficiency claimed for the Dodge installation of air-cleaning is said to be due principally to the fact that dirt and dust, once removed from the foundry, are isolated so thoroughly that they do not enter the air again.

A.S.M. To Meet in Atlantic City

The 1937 metal congress and exposition will be held from Oct. 18 to 22 in the public auditorium at Atlantic City, N. J., under the auspices of the American Society for Metals, Cleveland. W. H. Eisenman is national secretary of the society.

Book Review

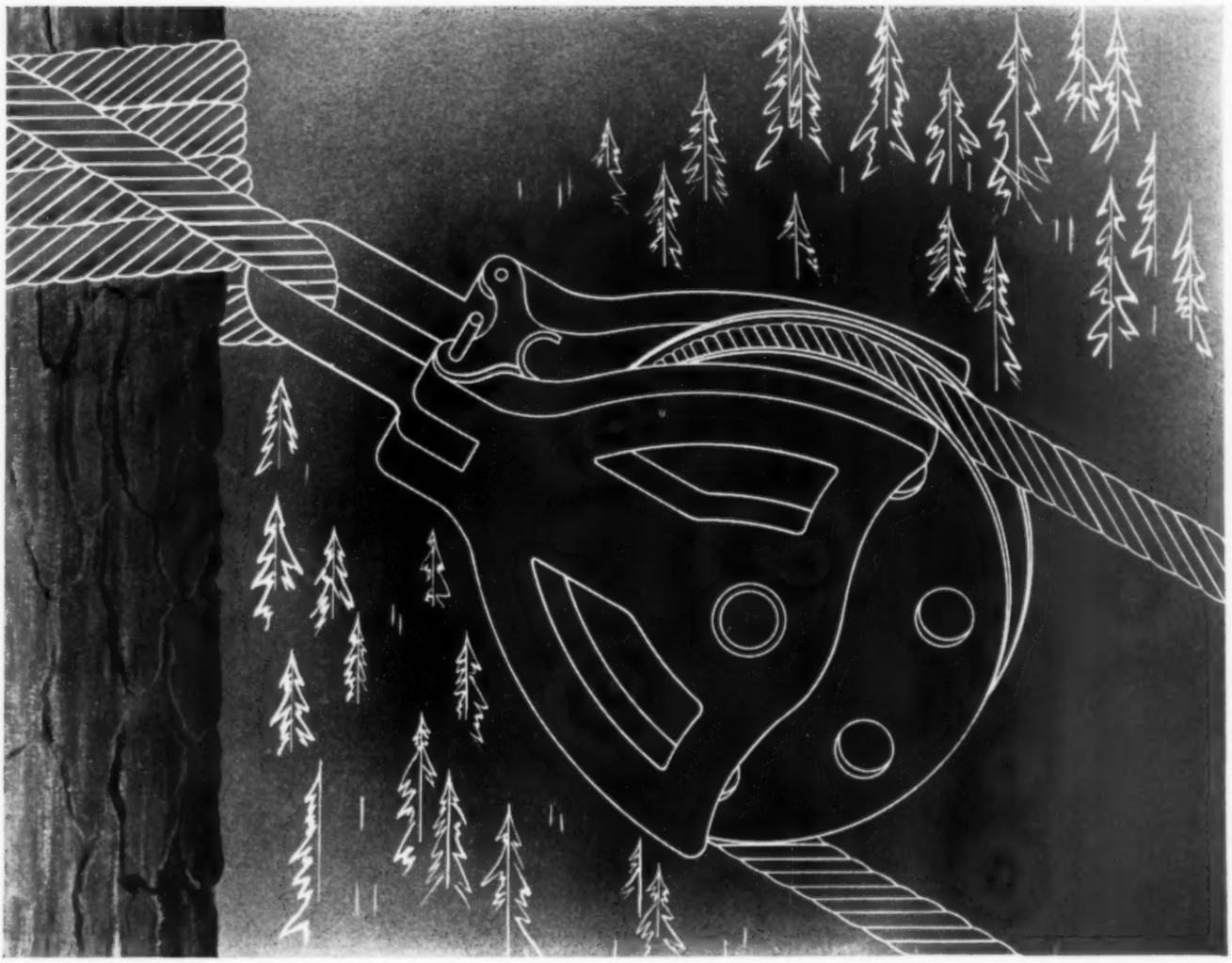
Organization and Management in Industry and Business, by William B. Cornell, M. E., cloth, 802 pages 5 x 8 inches with 173 illustrations, published by the Ronald Press Co. and furnished by THE FOUNDRY for $4.15 plus 15 cents postage, and in Europe by the Penton Publishing Co. Ltd., London.

The present work is the revised edition of a well-known text which has been used successfully during the past several years in schools and engineering colleges, and incorporates much that has been learned in the wide teaching experience of the author, with new features and additional topics. It reflects the most recent developments in management.

The object of the book is to give all students a comprehensive training in organization and management in operation of every department of a business concern including both commercial and industrial activities. It is pointed out that the nontechnical business student gains a great advantage in seeing the sharp definite application of management principles in industrial operation.

For Small Castings

Copper-silicon alloys containing 3 to 4.50 per cent silicon, 1 per cent manganese, up to 5 per cent zinc, up to 2.50 per cent iron, up to 2 per cent tin, and remainder copper are fluid and searching which makes it possible to run small castings of thin sections producing sharp and well defined outlines. Light section castings usually are molded in No. 0 Albany sand while No. 1 or No. 2 Albany sand is used for those of heavier section. The moisture should not be more than 6 per cent, and in the case of heavy sections the molds should be baked.



MOLY steel's greater strength means less weight—easier handling

WHEN operating equipment has to be handled by man-power, the importance of light weight through the use of the strongest possible material comes home with telling effect. Logging blocks, for example. Ask any rigger what a back-breaking job it is to tote them aloft. Think, too, of the abuse they get. . . . Dropped from great heights, battered and banged around, exposed to weather—it's a hard life they lead.

By making side frames and sheaves out of 2% Nickel-0.40% Moly steel, the weight of logging blocks can be reduced one-third to one-half—without sacrifice of strength. Similar foresight in the construction of other forms of industrial equipment can lead to corresponding savings in time, labor, wear, depreciation.

What do you make or use that would gain through lighter weight, higher strength, greater resistance to impact, abrasion, creep, corrosion? Look into Moly and its many-sided qualities for improving any steel or iron—whether plain or otherwise alloyed. Our helpful technical book, "Molybdenum," goes into the subject at considerable length. Yours for the asking—as is also our periodical news-sheet, "The Moly Matrix." If interested in some particular ferrous problem, our laboratory facilities are at your disposal.

CLIMAX MOLYBDENUM COMPANY, 500 FIFTH AVENUE, NEW YORK CITY

PRODUCERS OF FERRO-MOLYBDENUM, CALCIUM MOLYBDATE AND MOLYBDENUM TRIOXIDE

MOLY Mo-lyb-den-um

CUTS COSTS

CREATES SALES

Reader's Comment

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of The Foundry or of Its Editors.*

Imbibe Freely

TO THE EDITORS:

I cannot let the opportunity go by without a word of praise concerning the October issue of THE FOUNDRY, every page of which has something of value to everyone fortunate enough to have a copy available.

I have also carefully read the Cost Planning article and, like the missionary, pray that the poor unfortunate who has not come across the same might do so and imbibe freely of the contents. It would seem in our district particularly, that the ignorance prevailing among foundry owners is appalling, and like the aforesaid missionary, continuous missionary work must be done to remedy the condition.

FREDERICK H. LANDOLT
Penn Brass & Bronze Works
Brooklyn, N. Y.

Calculations

TO THE EDITORS:

While reading the October issue of THE FOUNDRY, I was very much interested in the article, "Intelligent Planning Cuts Costs", by James J. Zimmerman. On his Cost Accumulation chart there is an error in the figure for Total Plant Cost. The chart has this amount as $3694.74, but it should be $3994.74. This affects all subsequent totals including "Gain".

FRED J. SCHLEGEL
Pottstown, Pa.

What To Do

TO THE EDITORS:

Some of the articles in THE FOUNDRY recently have dealt with the shortage of skilled labor in the foundry industry. Without being a labor agency, I wonder if you can help me. I have been in foundry work since I was 16 years of age, except for the periods of time that I was attending school. I graduated from an A-1 technical school that taught a course in foundry practice, and also attended a State university for 2½ years. My experience has consisted of the usual floor, bench and machine molding, cupola and pattern shop, over a period of 5 years.

Here is my problem! At the present time I am employed, and am earning a salary of over $2000 a year. I am not satisfied, because at heart I am a foundryman, and although working in a foundry at the present time, we make just one product which requires no skilled labor whatsoever. I feel that I am wasting what good practical and theoretical experience that I have. If I apply for a position now, I am told that I am too highly specialized because I have been employed by my present company for the past 5 years.

What do you advise? Being only 33 years old, should I stay with my present company or try to get back into the regular swing of the foundry game?

H. G. S.

Book Review

Technology of Aluminum and Its Light Alloys, by A. von Zeerleder, cloth, 6¼ x 9½ inches, 301 pages, published by Gustav Fock, New York, and supplied by THE FOUNDRY, Cleveland, for $5.50, plus 15 cents postage, and in Europe by the Penton Publishing Co. Ltd., London.

This volume, translated from the second German edition by A. J. Field, is designed primarily for the practical man, and consequently data on production of aluminum and theory of alloys are limited to phases necessary for the understanding of the correct methods in subsequent manufacture. Also theoretical considerations are eliminated where possible in favor of practical data. The book is divided into 20 chapters of which the first two relate to production of aluminum and theory of alloys. Chapter III discusses alloys of commercial importance and Chapter IV describes properties and methods of testing. Furnaces and furnace operations is the title of the fifth chapter while rich alloys are covered in the sixth.

Chapter VII relates to casting, covering such phases as ingot and billet casting, permanent mold casting, die and press casting, and sand casting. Chapters VIII through XIII describe sheet rolling, extrusion and drawing of tubes and sections, forging, press work and spinning, wire production and welding and soldering. Riveting, machining and aluminum powder manufacture are discussed in Chapters XIV, XV and XVI while Chapter XVII deals with surface treatment including mechanical, chemical and metallic surfacing treatments, and surface protection. Chapter XVIII covers general considerations in design and construction, and Chapter XX, fields of application. The book also contains an extensive bibliography and a brief index.

Apprentice Featured In Quad-City Talk

The Quad-City Chapter of the American Foundrymen's association held its Nov. 16 meeting in the LeClaire hotel, Moline, Ill., with approximately 90 attending the dinner and 130 present at the meeting. Representation included many teachers and officials of the public school. Following his introduction by T. J. Frank, chairman of the chapter, J. H. Ploehn gave a brief resume of the training of foundrymen in the Quad-City area, emphasizing the existing need for more of such training, and introduced the speaker of the evening, James G. Goldie, foundry instructor of the Cleveland Trade school, Cleveland.

Mr. Goldie, speaking on "An Apprenticeship That Works," pointed out the necessity of apprentices in the foundry industry and mentioned the numerous articles written in technical papers during the last few years, referring to a means of supplying the demand. The speaker defined an apprenticeship as that training which gives equal consideration to head work and hand work, a systematic and practical training adapted to local demand from the trade and industry.

Guidance of students into trades was also an important part of Mr. Goldie's talk. It should be started as soon as possible, he said, and handled by individuals who know the needs of the various lines. Responsibilities of training lie in the schools, management, foremen and fellow workers. The Cleveland plan of training apprentices was explained by Mr. Goldie. Placements have been 100 per cent since that school was started.

The next meeting of the chapter will be held Dec. 21 at Rock Island, Ill.

Newark Wire Cloth Co., Newark, N. J., has appointed W. C. Myers & Co. as representative in the Oklahoma territory. The company's office will be located at 8 North Cheyenne street, Tulsa, Okla. The Pittsburgh office of the wire cloth company has been discontinued.

835 AN HOUR!

Sandslingers are equally available on production, jobbing work and cores—on dry or green sand molds for large or small, gray iron, steel, malleable or nonferrous castings.

A leading motor car manufacturer now produces 835 brake drum ring molds per hour with an Automatic *Sandslinger* and a seventeen man molding crew including all labor. The ramming, strike off, pattern draw, and pattern spray *are automatic*—rolling over of the mold, inspection and placing of the molds on the pouring conveyors are the only manual operations.

835 molds per hour — 14,195 pounds of castings per hour — 835 pounds of castings per man per hour — that's high speed production — production that is only available through the use of *Sandslingers;* and every casting is exact-to-pattern and of minimum weight.

If yours is a high production job — let us give you the details on Automatic, Swing, Tractor or Stationary *Sandslingers.* If you're doing jobbing work — Motive or Motive Junior *Sandslingers* will serve you well.

Let us give you details of how *Sandslingers save*—in labor — time — floor space — casting weight — accessory equipment requirements and general overhead. Write for the facts today!

Cut your costs with

BEARDSLEY & PIPER CO.

2541 N. KEELER AVENUE, CHICAGO, ILLINOIS

SANDSLINGERS, SAND HANDLING, PREPARING, MOLDING AND SHAKE-OUT EQUIPMENT

REPRESENTATIVES IN PRINCIPAL FOREIGN COUNTRIES

Tracing limbs on the old family tree

The Adventures of BILL

By PAT DWYER

THE curse of Crummle," Bill remarked fervently the other night "on the bird who first invented the practice of making speeches."

"Why the sour note?" I inquired. "The great American presidential derby is over and you won't have to listen to the drool and drivel for another 4 years."

"Listening to 'em is not so bad. I can leave a meeting, or I can shut off the radio. What's bothering me now is that I have been hooked to give a talk next Monday night. Listening to a fellow talking, and doing the talking yourself are two different things. A chattering magpie in our club suggested several months ago that it would be a grand idea to have each member deliver an address at some meeting during the year. The names of the speakers to be drawn by lot at each preceding meeting. With the proverbial luck of the Irish I escaped up 'til now. I had a resolution all ready to discontinue the practice next year, and then, bingo, I get nipped for next week. "Tough," he concluded moodily, "tough, I calls it."

"Well," I said. "If you are nipped behind the eight ball, I suppose you are nipped and will have to go through with it. I have neither the time nor the inclination to do any ghost writing for you, but I can give you a hint or two for going through the ordeal with a minimum amount of suffering.

"Occasionally I have been selected to run the gauntlet and on each occasion I have been reminded of the American visitor who was shown through one of the stately homes of England by the butler, a very dignified lad in puce velvet knee breeches. He had particular pride in showing the visitor the picture gallery containing paintings of all the prominent men and women of the house, dating back many centuries.

"Commencing at one end with a picture of the noble Lord then in residence the butler visibly swelled up like a turkey gobbler while pointing out that 'Is Ludship had served gallantly with 'Is Most Grycious Mejisty's forces in the late world war. Continuing leisurely down the line he pointed to others who had served in the army, in the navy, in the church, at the bar and on the bench and in various other positions in public life. One had been an admiral, another a general, another an archbishop, another a lord chief justice and one had been vice-roy of India. In every capacity they had served as links in the mighty chain that binds the British empire together. A chain that has for its clasp the great blood red, lion banner of England.

"By far the greater number were depicted in uniform or in martial garb of one kind or another. This family leaning was reflected in what the butler described as a bit o' verse carved on a wooden plaque over the great central fire place.

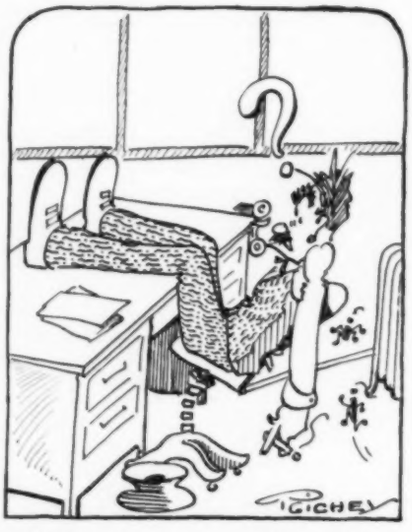
A moth eaten rag on a worm eaten pole,
It doesn't look likely to stir a man's soul.
'Tis the deeds that were done 'neath the moth eaten rag,
When the pole was a staff, and the rag was a flag!

"Pictures showed former men of the house who had distinguished themselves in the Boxer uprising in China and in the Boer war in South Africa; in the Egyptian and Sudan campaigns where a young cadet had perished with Chinese Gordon in Khartoum. They had a hand in the Franco-Prussian war and they had been in Afghanistan and through the Sepoy rebellion in India. They had fought at Inkerman, and Balaklava and Sebastopol in the Crimea. They had carried the old red duster—affectionately known by a more gory name to the men of the naval and merchant marine—at their mast head while their prows smashed through a great iron chain stretching from shore to shore at the Golden Horn.

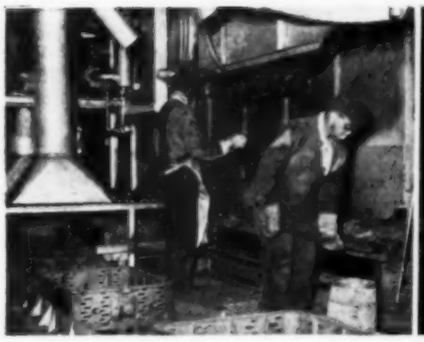
"One had been a captain with Nelson at Trafalgar and another with Wellington at Waterloo where Napoleon's meteoric career of empire came to an end in rolling cannon smoke, and where the Old Guard died but never surrendered. One was a high ranking officer with Clive in India while another sat on the woolsack in England and heard evidence in the trial of Warren Hastings.

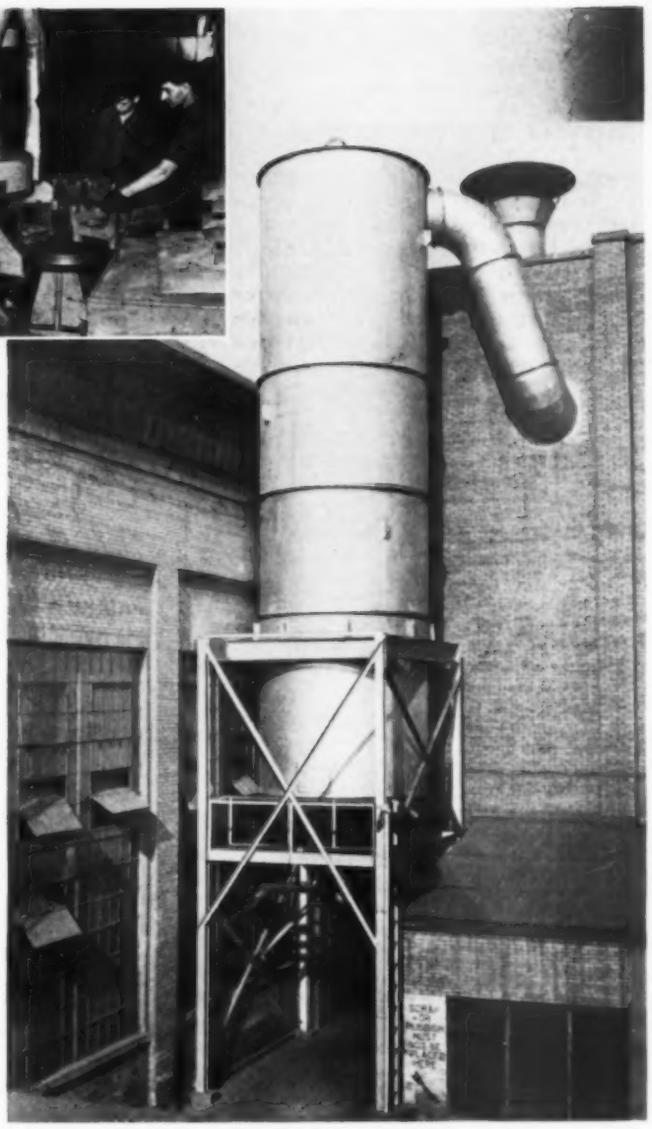
"In an earlier day the head of the house had supported Bonnie Prince Charlie in his attempted come back and had his own troubles with the powers that be for many years after Culloden. One of the sea faring tribe had followed Lord Howard when the topmasts of the Spanish Armada appeared above the hori-

(*Continued on page* 56)



Study in still life. Ye editor working



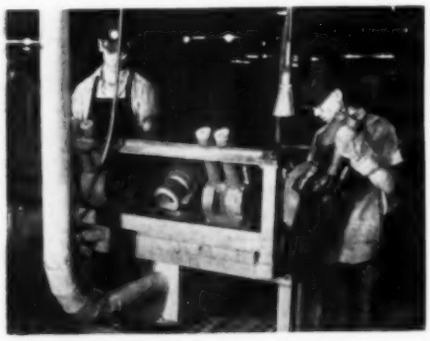


For Foundries Large and Small—Schneible Multi-Wash Dust Collectors!

The Schneible Multi-Wash Method of Dust Suppression has been accepted by foundries large and small as the most logical means for eliminating dust hazard because it's positive; because it's efficient; because it's foolproof; because it's non-freezing!

These reasons are self-evident. Positive because of constant back pressure—$2\frac{3}{4}$" at rated capacities. Efficient because of an assured greater dust recovery plus no wearing parts and no leakage. Foolproof because there are no moving parts — no adjustments and no manual operations. Non-freezing because they are unaffected by zero temperatures and the rigors of winter weather.

Schneible Multi-Wash Collectors are available, and equally efficient, for suppressing dust in general atmospheres, at molding stations, sand preparation plants, cleaning mills and barrels, at the shake-out, and in the grinding department. They are also used for collecting dust from powdered coal crushers and burning equipment, and for suppressing noxious fumes from heat treating, cyaniding, and other processes.



A single 30,000 c. f. m. Multi-Wash Collector, one of several used in a large Detroit automobile shop and three interior views are shown. A hooded shake-out and two well ventilated core finishing benches.

Schneible Multi-Wash Collectors, Multi-Louver Dewatering Tanks, and "Wear Proof" Pumps are made in sizes and types to meet every dust collecting problem. Send for a copy of Catalog No. 10. Let our engineers make a survey of your operations and recommendations on how to eliminate your dust hazard!

CLAUDE B. SCHNEIBLE CO.
DUST SUPPRESSION ENGINEERS
3951 LAWRENCE AVE., CHICAGO . . . . *Offices in principal cities*

(*Continued from page* 54)

zon. He helped to land a few shots where they would do the most good, before a hurricane—an act of God according to the pious British and an act of the evil one with whom the British undoubtedly were in league, according to the equally pious Spaniards—blew up the channel, seized the Spanish ships and drove them flying like a herd of frightened stags, to be smashed to kindling wood on the rocky shores of Ireland and Scotland, with the survivors meeting an even more bitter fate on the lonely and inhospitable outer Hebrides and the Orkneys.

"The same ancestor, or maybe one of his cousins later crossed the Atlantic, cruised up and down the Spanish Main, helped other gentlemen adventurers rape the galleons and plate ships and was among those present when Morgan put the torch to Panama city. A very spirited if-ah-slightly biased chronicle of doings during this period is presented in the late Mr. Kingsley's *Westward Ho.*

"Going still further back they had fought in the Wars of the Roses and they had joined the Crusades which had for their alleged object the wresting of the holy sepulchre from the hands of the paynim. With nations as with individuals one excuse is as good as another for starting a row. According to the butler one lad down near the end of the line was right hand man for Richard of the lion heart during those stirring days.

"Finally they came to the last picture in the collection, a faded and wishy-washy presentation of a tough looking bird with a beard, a square cut beard and the aquiline profile of one of the better looking birds of prey. To quote the butler, an 'awk. This lad mounted on horseback and encased in a suit of mail, had a long spear in one hand and a particularly unpleasant looking spiked maul in the other hand.

"They gazed at this masterpiece for some time in silence. Then the visitor inquired. 'What did his nibs do?'

"The butler said, 'I beg pawdon, sir?'

" 'I said,' said the visitor. 'What did he do? What was his racket? What did he work at?'

" 'Oh,' said the butler drawing himself up haughtily. ' 'E was the founder of the family!'

'I kinda gathered that impression,' says the visitor, 'since he is perched here at the end of the line. But that ain't what I'm getting at. Dash it all man he didn't spend all his time founding the family. What did he do—Oh, well. Let it go. Let it go.'

'Thank you sir,' said the butler. 'Very good, sir.' "

"Well," said Bill. "So what?"

"Every now and again I am asked the same question: What do you find to occupy your time? I answer truthfully enough that some days I spend hours and hours with my feet cocked up on the desk wondering what I shall say to a bunch of highbinders that night. The only point on which I am in doubt is how long I should talk. At a pinch a man can cover nearly any subject in 5 to 10 minutes. However, I hate to be pinched, mentally, physically or in the sense in which the word usually is employed in recent years with a cop as the pincher.

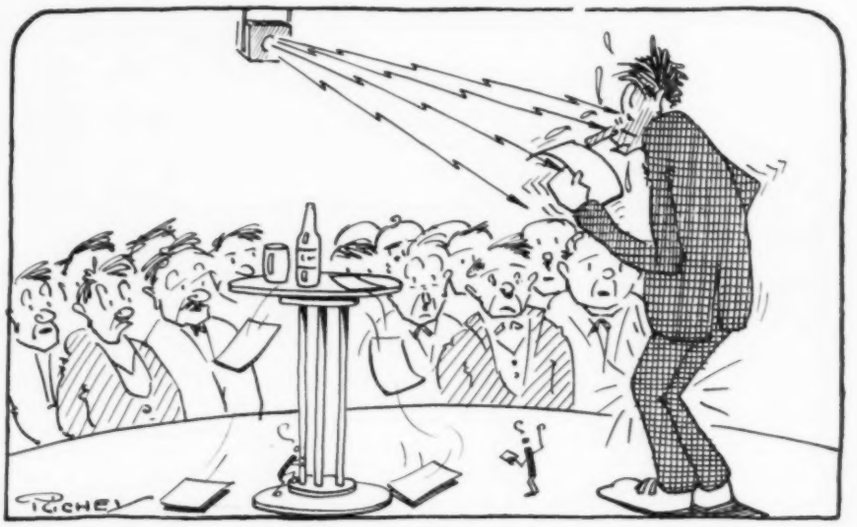
On the other hand I don't want to find myself in the position of the lad who delivered a very long and a very dry speech. You have heard lots of 'em lately. Later he was rather anxious to learn how his effort had been received. He buttonholed the old reliable Richard Roe.

" 'What did you think of it Dick,' says he. 'What I mean to say do you think I threw enough fire into my speech?'

" 'Well,' says brave Richard, ever the candid friend. 'To tell you the honest God's truth Jno., ol' man, ol' kid, I don't think you threw enough of your speech in the fire!'

Many years ago, shortly before the Chief died, he and I were invited to speak before a meeting sponsored by the board of trade or the chamber of commerce or something in a town down state. You remember the Chief and how his charming, dynamic and magnetic personality illuminated everything he said. He could discuss the price of pig iron, the specifications for steel scrap or the probable effect of the tariff on the importation of bull hides from the river Plate in Argentina and hold his hearer's attention as closely as the radio announcer covering a tie game at League park with the Indians at bat in the ninth inning, with the bases loaded and with Joe Vosmik all set to wham one on the nose and knock it to hellangone over the bleachers. In a word if you get what I mean, he was good.

"When he was through on this particular occasion, or for that matter on any occasion, there was nothing more to be said. I confined what few remarks I had to make to a more or less facetious reference to the functions and activities of boards of trade, chambers of commerce, luncheon clubs and other more or less useless and ornamental organizations who in their insatiable lust for fresh speakers and consequent lumping together of amateurs and professionals, practically have ruined oratory as a fine art.



Some men seem to enjoy this form of self-inflicted torture

"On the way back to town that night, naturally we discussed some of the events and the incidents of the meeting. I asked the Chief what he thought of my maiden effort.

" 'Well,' said he, 'I'll tell you. Your line of chatter was entertaining, but in future—that is if we go out again—in future for the love o' Pete, try to mix a little meat with the garbage. These birds want something to chew on!' "

"Interesting," said Bill, "but why are you handing me all this tripe?"

"I am coming to that. Have patience. As a result of the foregoing experience I developed a sure fire method for preparing and delivering a public address. Certainly I would not disclose this secret to every person, but for auld lang sine and so forth I am willing to pass it along to you. I am sure you will not let it go any farther. Besides, this stuff is informative as well as entertaining, a little meat among the garbage.

"The statement that I developed

(*Concluded on page* 86)

Just what you need in

BLAST ROOM

EFFICIENCY. ECONOMY. CONVENIENCE

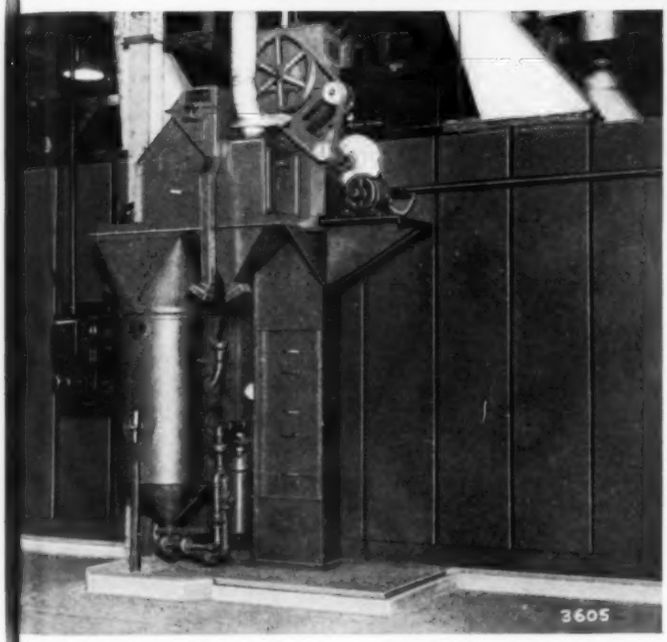
One of the latest Sly Blast Room installations, with doors at both ends and monorail. It affords a splendid view of ceiling which allows an almost unrestricted entry of clean air in the Sly DOWN DRAFT Ventilating System.

•

YOU are aiming for greater tonnage of cleaned castings at a lower cost per ton of cleaning - - that is WHY a Sly Blast Room Installation is certain to interest you. Never before has a blast room shown such modern advancements in efficiency, economy and convenience.

Sly Blast Rooms - - for Sandblast, Shotblast, Gritblast - - are equipped with various handling accessories such as Turntable, Monorail, Car Track and Car or any combination of these accessories.

Write us. There is an experienced and competent representative near you, who will gladly figure on your requirements.



A partial side view of Sly Blast Room, showing the Sly bucket elevator, abrasive cleaner and pressure blast tank. The abrasive cleaner, by a simple and positive process, without moving parts, separates dust and foreign matter from used abrasive, thoroughly reconditioning it for re-use. The Sly pressure blast tank, simple and fool-proof, gives you positive control of abrasive flow in all blast-cleaning, note reinforced rib construction of room side walls, also accessibility to all equipment.

•

Sly Blast Rooms Offer You - -

DOWNDRAFT VENTILATION. A constant suction of clean air is drawn down through the ceiling, arresting the dust at its source and exhausting it from the room, near the floor.

CLEAR VISION. Dust stays down - - and special electric lighting offers properly diffused illumination inside of room.

SIMPLE BLAST CONTROL. The operator controls the blast by a single lever, inside of room.

EVER-CLEAN ABRASIVE. Sly Blast Rooms provide reclaimed abrasive that is air washed and thoroughly free of foreign particles and dust.

DURABILITY. Sly construction - - quality construction - - and simplified design, assure you the longest, most dependable and most economical blast room service that your money can buy.

Typical large Sly Blast Room in a steel foundry. It has doors at both ends and is equipped with car tracks, cars.

DUST CONTROL SYSTEMS . . . BLAST CLEANING EQUIPMENT . . . TUMBLING MILLS . . . HELMETS . . . ABRASIVES

The W. W. SLY *Manufacturing Co.*

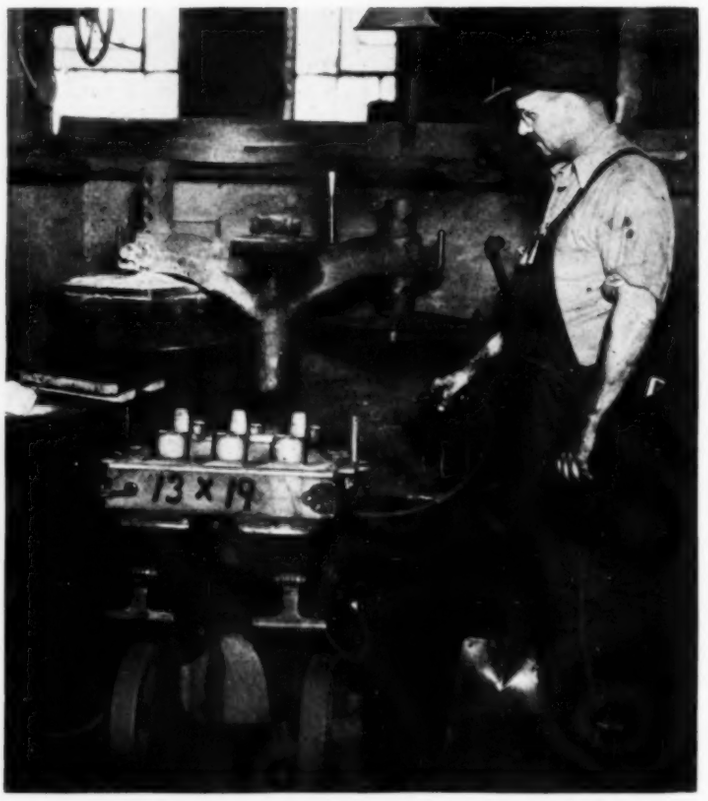
4703 Train Avenue, Cleveland, Ohio.

At the left
TYPE SB10 CORE BLOWER
(Write for Circular No. 536)

At the right
TYPE R Hand Ramming Core Turnover Draw Machine

Type RES
Jolt, Squeeze, Rollover, Draw Machine

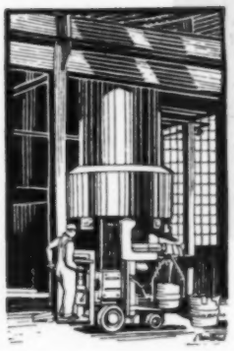
Write for Circular No. 436 describing this machine



Type LJSD Double Head Jolt Squeezer eliminates hand peening, thus increasing production and insuring uniformity of castings.

Our 1937 CALENDAR showing a number of interesting foundry views is now ready. Write for your copy.

INTERNATIONAL MOLDING MACHINE CO.
2608-2624 W. 16th St. Chicago, Ill.



VIEWING FOUNDRY DEVELOPMENTS

At Short Range

IN RECENT years an interesting technique has been developed in gray iron foundries engaged in the production of die blocks for the automobile industry. Instead of making a complete dry sand mold, the body of the mold in many instances is made in green sand. An extremely clean face and accuracy of contour on the working surfaces of the casting are secured by forming the corresponding parts of the mold in oil sand cores blackwashed. The cores are made in advance and then placed in proper position on the pattern where they are held in place by the green sand rammed around them. In many instances the method is mandatory since these one-off patterns are of the cheapest and elementary construction which would involve an excessive amount of hand finishing if the mold was made in the usual manner.

♦ ♦ ♦

An eastern foundry is reported to have obtained excellent results on long cupola campaigns by use of a water jacket on the outside of the shell which extends above the melting zone. The lower part of the cupola is lined with silica brick to a thickness of 4 inches, and it is operated day and night for a week before the bottom is dropped.

♦ ♦ ♦

AN IMPROVED type standard test bar, one in which the usual parting line is eliminated, is made in a two-part flask in green sand. Instead of lifting the cope to remove the pattern the patterns are drawn through openings in one end of the flask. The open end then is plugged with a short piece of dry sand core bearing on the inner end a number or identifying letter which is reproduced on the end of the bar. Two bars are molded in the flask and each is poured individually through a small pop gate near the end.

♦ ♦ ♦

A brazing alloy made up of copper and phosphorus and designed to replace the more expensive silver solders, melts at about 1300 degrees Fahr. It has a high tensile strength and excellent penetration. The brazing alloy is applicable to all kinds of copper and copper alloy joints where strength, or gas and liquid tight joints are required.

♦ ♦ ♦

TO PRODUCE the helical vanes on the outside of automotive brake drum castings, a prominent midwestern foundryman developed a device in which a thin grinding wheel cuts the desired grooves in a ring core. The ring core then is placed in a print in the mold provided for the purpose. Through an indexing attachment the wheel may be set to cut any desired arrangement of grooves. The wheel moves vertically while the ring core revolves on a horizontal table and the wheel cuts one groove while moving downward and a second groove while moving upward.

♦ ♦ ♦

Cylinder heads for a well known diesel engine have the following composition: Silicon, 1.80 *to* 2.0 *per cent; manganese,* 0.85 *to* 0.95 *per cent; total carbon,* 3.10 *to* 3.20 *per cent; nickel,* 1.40 *to* 1.80 *per cent; chromium,* 0.30 *to* 0.40 *per cent, and molybdenum,* 0.30 *to* 0.40 *per cent. Thirty-five to forty per cent steel scrap is used in the mixture, and the castings are heated slowly to* 1000 *degrees Fahr., and cooled in the furnace. Minimum tensile strength is given as* 45,000 *pounds per square inch, with a minimum brinell of* 200 *to* 220.

♦ ♦ ♦

A good iron for use in grate bars, fire pots, stoves and furnace linings contains 1.75 to 2.25 per cent silicon; 3.00 to 3.50 per cent total carbon; 0.50 to 0.80 per cent manganese, and 0.85 to 1.25 per cent chromium.

♦ ♦ ♦

The plumber's practice of cutting cast soil pipe by marking a seam around the barrel with a cold chisel and then dropping one end on the ground to break it, is used in one soil pipe foundry to determine whether its product meets requirements in the field. The breaking test is performed on a few pipe selected at random from the daily run.

♦ ♦ ♦

In pouring any nonferrous metal or alloy, the ladle should be held as closely to the sprue as is possible and a steady stream maintained to prevent formation of dross and the entrapping of air.

♦ ♦ ♦

CASTING bronze gears to close tolerances is accomplished in one foundry by use of molds made of plaster and wood flour. In making the molds, the liquid plaster and wood flour is poured into greased metal boxes, and just before it solidifies an oiled master pattern is forced into the mass by a ram. Solidification hastened by heat, is completed in a few minutes, the pattern withdrawn, and the mold removed from the box. The mold then is placed in a furnace heated to a high temperature where the wood flour burns out, leaving an extremely permeable mold. The mold is permitted to cool down to handling temperature when the molten metal is poured in. Molds, due to their fragile nature can only be used once.

♦ ♦ ♦

A heat resisting cement for foundry use is claimed to resist temperatures up to 3600 degrees Fahr. The product is shipped dry, requiring only water for mixing to the desired consistency. Fields of use include on crucibles, skimmers, stirrers, tongs, iron melting pots in nonferrous, and on ladles and spouts, and cupola linings in the ferrous foundry.

♦ ♦ ♦

The new 60 horsepower V-8 automobile motor has the cylinder blocks and crankcase cast integral, and uses cast alloy steel pistons, cast alloy steel crankshaft, cast alloy iron camshaft, and chrome alloy steel valve inserts.

Foundry Equipment Exports Up

By William H. Myer, Assistant Chief, Machinery Division, Dept. of Commerce

United States exports of foundry equipment, including cupola accessories, molding machines, sand-preparing equipment, riddles, tumbling barrels, and similar items, have shown a strong upward tendency during 1936, somewhat in synchronism with the upturn in domestic sales. Total foreign shipments have amounted to $1,879,709 during the first nine months of this year, as compared with $983,807 worth during the full year of 1935, and $445,535 in 1934.

Gains in foundry equipment have been more pronounced than in most of the other types of industrial machinery. Total exports of industrial machinery through Sept. 30 of this year amounted to approximately 116 million dollars—not quite up to the figure of about 122 millions reached in the full year 1935. It is interesting to note that foundry equipment exports also have gone ahead of forging machines this year, of which $1,343,586 have been shipped abroad in 9 months of 1936, comparing with $1,647,568 last year.

The feature of this year's foreign business in foundry equipment has been the large purchases made by Russia, which took from us $1,381,762 worth up to the end of September. The bulk of this went out during the first 3 months, but shipments of moderate size have been going to Russia each month, except in June. Russia was also the largest of our foreign customers for equipment of this nature in 1935, when shipments to that country were valued at $468,210. In 1934 Russian business totaled only a little over $45,000.

Among our other foreign outlets for foundry machinery, Canada and England are to be expected to purchase substantial amounts each year. Last year Canada took $146,027 and shipments in the first three quarters of 1936 reached $201,241. England bought about $44,000 worth during 1935, and has taken nearly $76,000 in 9 months this year. Exports to Australia this year (9 months) have been over $48,000 in spite of the numerous handicaps in getting American machinery admitted there.

France bought well over $126,000 from us last year, but sales there have been much smaller this year, amounting to less than $34,000. Nearly all of the industrialized countries have loked to the United States for some part of their needs for foundry machinery. Czechoslovakia, Mexico, Chile, and Japan have each taken amounts running from $18,000 to $26,000, and a long list of other countries have had smaller shipments during the period up to Sept. 30.

Cast Iron Runners On Bobsled

Something new in bobsledding history and the use of cast iron was introduced by Robert Linney, superintendent of the Chateaugay Ore & Iron Co., Lyon Mountain, N. Y., last winter. Prior to the contests at Lake Placid, Mr. Linney was approached by J. Hubert Stevens, the Olympic bobber, who was seeking sled runners of cast iron, believing that they would have less friction than those constructed of steel.

Becoming interested, Mr. Linney constructed an all-metal sled which, it is believed, will revolutionize the sport. Several inches closer to the ground than the ordinary type, the runner is cast as a unit and finished in silver bronze. Designed at Lyon Mountain, it was constructed of iron mined 60 miles from Lake Placid, N. Y., by the Chateaugay Ore & Iron Co. The sled, called Ironshoes, weighs 483 pounds, coming within two pounds of the weight limit allowed for 4-man bobsleds.

Mr. Linney, who had never seen a racing bobsled until the past winter, used the cast iron runners to win the National A. A. U. junior 4-man bobsled championship at the Mount VanHoevenburg run at Lake Placid. Cutting an average of more than two seconds from the best time of each heat, he made the four heats of a mile each in a total of 4 minutes, 42 seconds. Mr. Linney's second heat was the fastest of the day, making the mile in one minute, 10:20 seconds. Later, at the request of the National A. A. U., the sled was shipped to Germany for exhibition at the Olympic games.

Features Talk on Cupola Practice

Gottfried Olson, foundry engineer, National Founders association, spoke on "Cupola Practice" at the Nov. 25 meeting of the New Jersey Foundrymen's association held at the Downtown club, Newark, N. J. The speaker described what he believes to be the best present-day practice for ordinary mixtures and for low carbon, pearlitic and high strength irons. He discussed briefly also the various problems related to coremaking and sand control.

Book Review

Structure of Metals and Alloys, by William Hume-Rothery, linen cloth, 120 pages, published by the Institute of Metals, London, England, and may be purchased through THE FOUNDRY, Cleveland.

(*Concluded on page* 62)

The Ironmaster, with Robert Linney driving, which won the National Junior 4-man bobsled championship at Lake Placid, N. Y., last winter, had cast iron runners

The World's FIRST *Free Wheeling* RIDDLE

with the DOUBLE EIGHT VIBRATION MOVEMENT

Ventilated motor, with capacity far beyond full load requirements — completely dustproof.

Just hook it up and turn it on.

Just plug into any electric outlet — operating cost is ridiculously low — safety ground wire standard equipment.

Smooth action accentuates the famous Double-8 Vibration Movement, a complex chopping-and-riddling action—fine work even with coarse sieves—excellent results with ***any*** foundry sand.

Mechanism dustproof, entirely enclosed — no exposed operating parts.

New FREE WHEELING movement eliminates excessive bearing wear — no rigid construction — more violent vibration and faster work, yet smoother freer action.

This name is your guarantee of efficient, dependable foundry equipment that will make more foundry profits.

Weighs only 70 lbs.— overall height only 34 inches—one man ***actually can*** handle it easily.

Sturdy construction is coupled with light weight.

Fits the standard size foundry sieve. Sieves can be quickly, easily changed.

To remove debris from sieve, simply tilt the riddle—overall length of riddle is so short that sieves need not be detached for cleaning.

Improved—Simplified—Strengthened

YET NO INCREASE IN PRICE

$135.00 f.o.b. Chicago

115 volt A. C. single phase 60 cycles

D. C. and 3-phase motors $7.50 extra

22 Years of Vibrator and Riddle Success!

Other famous Adams products—the RED Electric Vibrator (used all over the world) and the Universal *2-Minute* Fineness Tester for both production and laboratory work.

WRITE FOR DETAILS AND PRICES

FOUNDRY SUPPLIES MFG. CO.
2221 Orchard St.
Chicago Illinois

(*Concluded from page* 60)

This is the first publication of the new Institute of Metals monograph and report series. Sections are devoted to the electronic background of metallurgy, the crystal structure of the elements, atomic radiuses of the elements, primary metallic solid solutions, intermediate phases in alloy systems, and imperfections in crystals. Each chapter is provided with a bibliography of selected references and an adequate index is included.

British Study Steel Castings Research Report

THE first joint meeting of the Iron and Steel institute and the British Iron and Steel federation was held Oct. 30, in London, with H. Winterton, president of the Institute of British Foundrymen, in the chair. The second report of the steel castings research committee, prepared by a joint committee of the Iron and Steel institute and the British Iron and Steel federation was presented at that meeting. Among the members of this committee are several members of the Institute of British Foundrymen.

The report is divided into six sections: Section I is introductory. Section II, by Dr. R. H. Greaves, of the Research Department, Woolwich, deals with the properties of steel which affect the quality of steel castings. Section III, by Prof. J. H. Andrew, R. T. Percival and G. T. C. Bottomley, covers the subject of the fluidity of iron-carbon and other iron alloys. Section IV, by H. F. Hall, of the Research department, Woolwich, deals with the strength and ductility of cast steel during cooling from the liquid state in sand molds. Section V, by W. J. Rees, covers the work and program of the molding materials subcommittee, and section VI, by V. E. Pullin, deals with the present position of radiological examination of steel castings.

Fluidity an Important Factor

The discussion was opened by Sir Robert A. Hadfield, Hadfield's, Ltd., Sheffield, who, referring to Professor Andrew's section, said that he considered fluidity an important factor, with particular reference to high temperature in steel-casting practice. He stated that several years ago his firm had manufactured hydraulic cylinders, 34 feet long and 1¾ inches thick. In these cylinders the steel dropped 30 feet, and the castings had to withstand high pressure. This only went to prove that good steel castings were already made several years ago, but today much more complicated castings are made. Concluding his remarks, Sir Robert gave credit to the work of the molder in the foundry.

C. H. Kain, Lake & Elliot, Ltd., Braintree, Essex, convener of the steel castings subcommittee of the Institute of British Foundrymen, took part in the discussion on behalf of his committee. He mentioned that information given in the report on time required for certain section thicknesses to cool to the dangerous 1300 degrees Cent. range was exceptionally helpful and is a portion of the work which might be enlarged profitably. Such investigations give a useful lead as regards best location for brackets and chills. He questioned the statement that chromium has no detrimental effect on fluidity, and stated that steel containing 1.0 per cent carbon, 1.0 per cent manganese and 1.5 per cent chromium has been found to be difficult to handle in the foundry. Referring to the fluidity spiral test, he said that the effect of molding materials and mold washes on the length of the spirals profitably could be investigated, and also the effect of moisture content on the lowering of the fluidity.

When referring to section III of the report, he stated that it had been found by experience that factors affecting the condition of the metal, such as nature and type of charge, speed and method of working, etc., have a profound effect upon fluidity. He also pointed out that most of the work has been done on alloys not in regular commercial production, and that it would be interesting to have more data on normal steels. He also expressed the opinion that considerable attention should be given to devising a test which could be used in the foundry both for experiment and as a means of control. He suggested that many effects attributed to phosphorus are due to sulphur or to a combination of the two. He also suggested that the effect of different molding materials upon a standard steel could be studied.

Victor Stobie, Stobie Steel Co., Ltd., Dunston-on-Tyne, referring to a statement in section II of the report relative to the effect of dissolved oxides on fluidity, which effect, it is suggested, would tend to improve the fluidity of cast steel, stated that steel containing such oxides would have a lower fluidity than a steel without oxides, but higher fluidity than a killed steel. He also referred to the effect of surface tension on molten steel when it is running through a small or a large channel. He suggested that converter steel is more fluid than electric steel. J. Mercer confirmed this, but added that converter steel must be well killed. He mentioned that certain chromium steels have an optimum temperature for pouring.

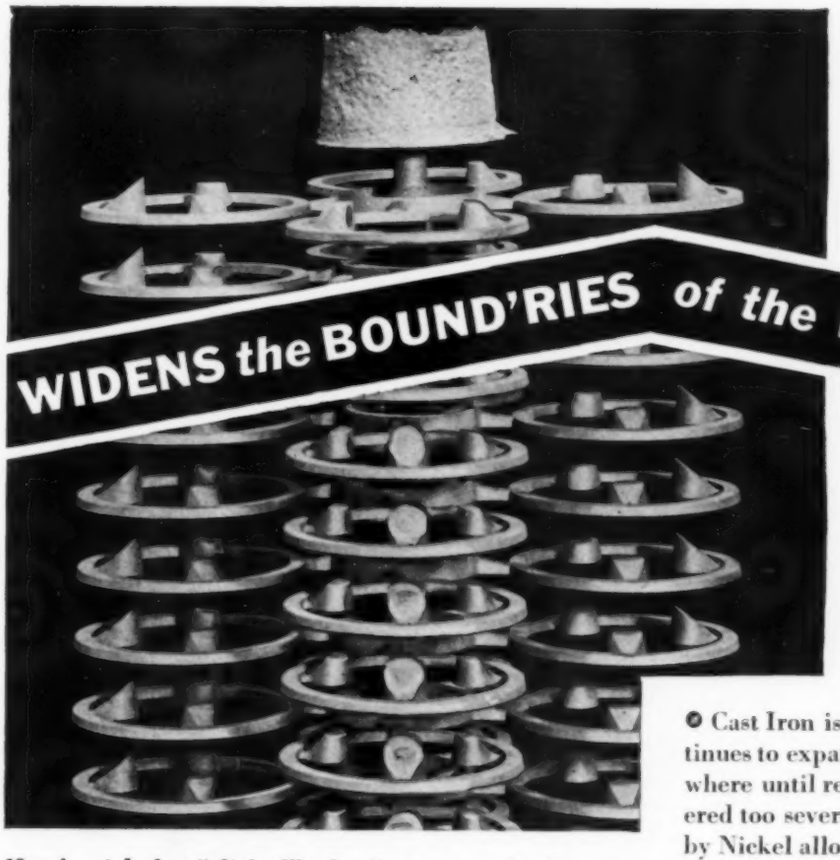
Dr. Hadfield stressed the importance of actually recording temperatures and fluidity, and emphasized the necessity of quantitative research in work of this kind. He added that one does not yet know what governs the difference between the fluidity of electric steel and converter steel. T. R. Walker, English Steel Corp. Ltd., Sheffield, representing the Institute of British Foundrymen on the committee, pointed out that the spiral test originally was evolved for cast iron and nonferrous metals, and not for steel. He mentioned the case of two foundries producing the same steel, one of which when deoxidized looked like cream and as if it was on the point of freezing, and yet it ran very well, the other steel also having good running properties, which showed that both foundries had obtained good results in different ways. He pointed out that there is much more to investigate, especially as regards alloy steels, some of which must be cast quickly to obtain good results.

Discusses Scrap at Detroit Meeting

Benjamin Schwartz, director of the Institute of Scrap Iron and Steel, was the principal speaker at the third regular meeting of the Detroit Chapter of the American Foundrymen's association, held Nov. 19 at the Fort Shelby hotel, Detroit. His subject was "Integrity, the Priceless Ingredient in the Foundry." Mr. Schwartz emphasized the importance of scrap in regard to foundries throughout the country and discussed the necessity of obtaining scrap from reliable sources.

Following dinner, Leslie Korte, chairman, introduced Dean C. J. Freund of the University of Detroit, who gave an interesting talk on foundry apprentice training. H. Bornstein will be the main speaker at the January meeting.

Climax Molybdenum Co. of Michigan has moved its Detroit office and laboratory to the new building at 14410 Woodrow Wilson avenue.

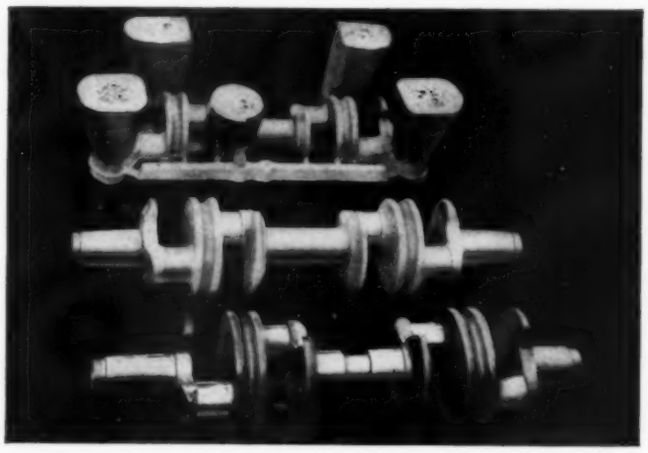


WIDENS the BOUND'RIES of the FOUNDRIES . . . .

NICKEL CAST IRON

Here's a job that "clicked"—thanks to properly alloyed cast iron. A "tree" of Nickel-chromium-molybdenum cast piston rings for diesel engines, just as it came from the mould.

Heat treated, these piston rings show high strength, toughness, hardness and wear resistance plus correct tension properties and hence longer life.



Not only superior performance but actual economy results from casting to shape these crankshafts for "Caterpillar" starting engines. Three stages in their production are shown: the rear, as they come from the mould; in front, the finished crankshaft. Caterpillar Tractor Co. got the desired properties for this job from a Nickel-molybdenum cast iron.

● Cast Iron is going places—and thanks to Nickel continues to expand its field of usefulness into many places where until recent years the requirements were considered too severe. Pictured here are three jobs well done by Nickel alloyed cast iron.

You regain old markets . . . you open new markets . . . when you produce Nickel alloyed cast irons. They possess higher strength and hardness, improved toughness and better machinability. Moreover, casting buyers are alert to the longer service life and greater machine shop economies available to them through the use of properly alloyed cast irons.

Uniformity in structure and consistency in repeating service records are characteristic of Nickel Cast Irons. Nickel combined with chromium or molybdenum—sometimes both—gives a combination of properties capable of combatting wear, stress, heat and corrosion.

Consultation on your problems involving the use of Nickel is invited.

The intricate thin-sectioned fins of this air-cooled motorcycle cylinder necessitate a material capable of giving a dense, grey structure free from chilling or porosity. Nickel Cast Iron not only accomplished this but rendered a harder and more wear resistant cylinder bore as well. Cast by Motor Castings Co., Milwaukee, Wisc. for Harley-Davidson Co.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

USE THE HERMAN AS A WEDGE

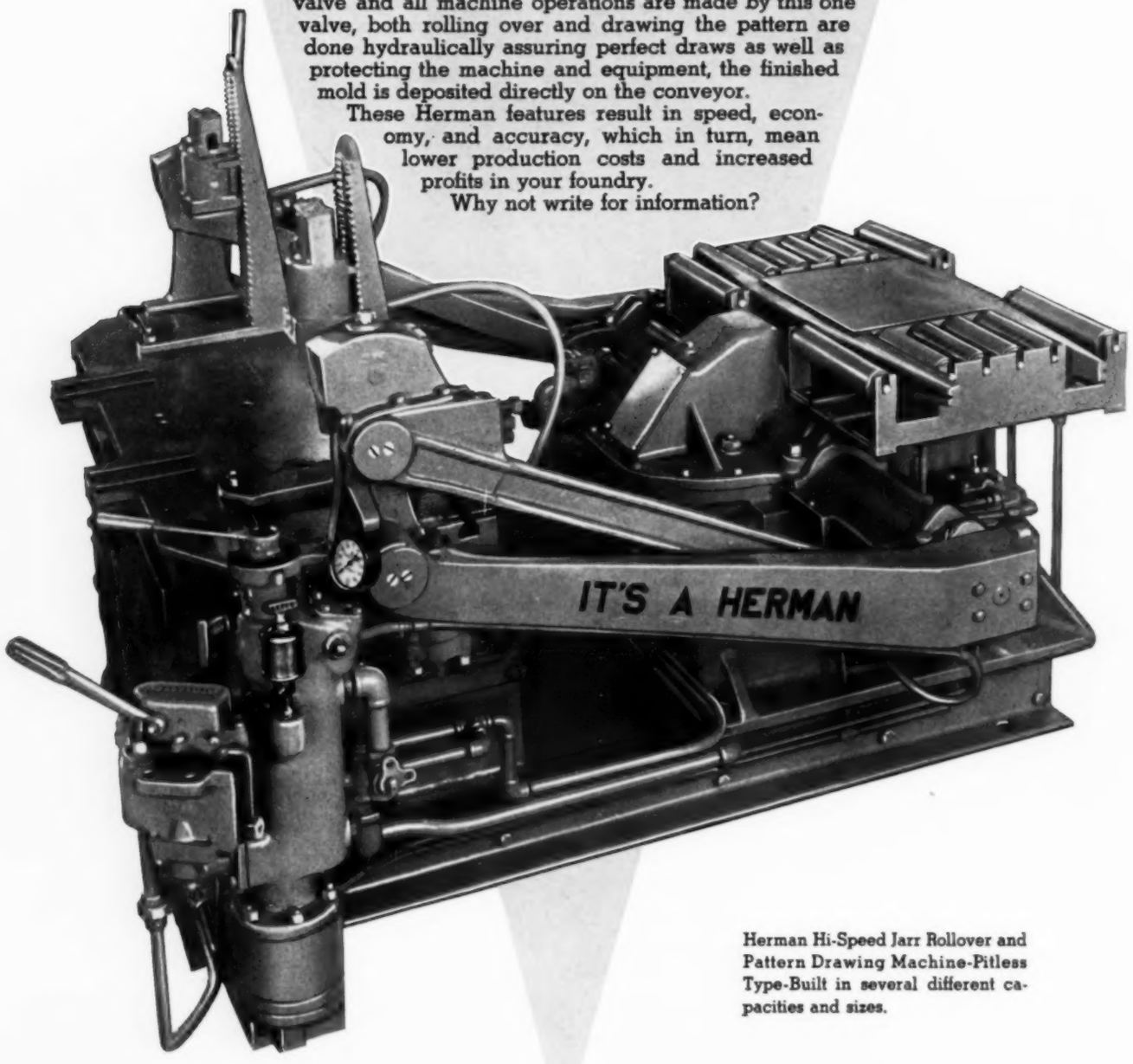
to lower production costs and increase profits

Better molds and lower molding costs is the report given from every Herman installation.

Patterns are easily and quickly changed, any size or depth flask can be instantly clamped or unclamped, when the molds have been sufficiently jarred the machine automatically stops, it is unnecessary for the operator to leave the control valve and all machine operations are made by this one valve, both rolling over and drawing the pattern are done hydraulically assuring perfect draws as well as protecting the machine and equipment, the finished mold is deposited directly on the conveyor.

These Herman features result in speed, economy, and accuracy, which in turn, mean lower production costs and increased profits in your foundry.

Why not write for information?



Herman Hi-Speed Jarr Rollover and Pattern Drawing Machine-Pitless Type-Built in several different capacities and sizes.

HERMAN PNEUMATIC MACHINE CO.

PITTSBURGH, PA.

European Foundry Practice

Digest of Recent Literature Covering Various Phases of Castings Manufacture

Tinning

Tinning Cast-Iron, L'Etamage de la Fonte, by Michael Cymboliste. *La Fonte,* Paris, December, 1935.

The principal difficulty in tinning cast-iron is in the preparation of the skin of the casting which must be perfectly clean and devoid of non-metallic inclusions. In dealing with the preparation of the surface of the casting, it is pointed out that graphite is unfavorable to the action of the tinning bath. It is found, however, that decarburization is an expensive process and that it can be avoided.

The cleaning of the surface of the piece to be tinned can be effected by pickling with sulphuric acid, hydrofluoric acid or hydrochloric acid. After pickling, the parts are cleaned in running water and then passed through an alkaline bath, following which they are, in some cases, subjected to tumbling or sand-blasting: in certain cases such mechanical methods of cleaning are used exclusively.

After having been cleaned, the surface of the castings is coated with a metallic coating—iron, nickel or copper—in order that the surface shall be more adhesive to the tin. This coating can be effected by immersion in a salt bath or by electrolysis. Various compositions of baths are given. The electrolytic method is recommended as giving a more regular coating.

Before the final tinning operation, the castings are dipped into a solution of zinc chloride, or ammonium chloride, or a mixture of both: This facilitates the attraction of the tin to the surface of the castings.

The actual tinning operation is effected either by immersion in a molten bath or in an electrolytic bath. In the first method, two baths are utilized, and a description of the composition of these baths and their temperature is given. Tinning baths must be cleaned from time to time. Generally speaking, the casting is completely tinned when all its elements have been coated, including the small graphite particles. This is realized when the tin actually forms an alloy with the cast-iron, and this necessitates a correct preparation of the surface of the casting, and a bath of the correct composition and temperature.

The electrolytic method of tinning is more simple than the immersion process. Only one operation is necessary to clean the surface of the casting. All that is required is an electrolytic degreasing operation, sometimes associated with slight pickling with hydrochloric acid; the electrolytic deposition of the tin; a cleansing operation, followed by drying.

The electrolytic deposition can be effected in a salt bath, or by means of acid or alkaline electrolytes. The best composition for a bath is given as follows: Stannate of soda (SnO_3Na_2), 85 grams per liter, and caustic soda, 15 to 20 grams per liter.

Castings that have been tinned by immersion present a bright surface, whereas the electrolytic method gives a dull surface, which can, however, be rendered brilliant by tumbling, or by heating in an appropriate medium.

Steel Rolls

A New Technique for Manufacturing Steel Rolls, Les Cylindres de Laminoirs—Une technique nouvelle de fabrication, by L. Quincy. *Revue de Metallurgie,* Paris, April, 1936.

It has been shown that the defects which usually appear in cast-steel rolls are caused by the effects of gravity in vertical pouring. To counteract these effects, experiments were made in which the molds were completely filled with molten steel and then submitted to a centrifugal process until the molten metal became solidified. In this process the molds are filled horizontally. Following these experiments, sections across the rolls were taken, and it was found that the metal was sound throughout the useful part of the roll and that piping took the form of a regular canal of small diameter following the axis of the roll. Actually, the importance of the piping was found to be twice as great as when the roll was cast vertically, but it was definitely located in the center, where it could have no detrimental effects, and it was found that the actual metal of the roll, particularly in the useful part, was compressed.

A description of the experimental process is given and is followed by a description of the mechanism actually employed commercially. In the commercial process, a means of introducing a rod at each end of the axis of the roll and through the piping is provided for.

The general advantages of the process are: Firstly, to avoid the unfavorable effects of gravity, and, secondly, through centrifugation to obtain the metal in the solidified state with much smaller crystals than in the ordinary method, thereby obtaining a more homogeneous casting.

A complete description is given of the technique of the process and of the calculation of the speed of rotation of the mold, and formulas are given from which it can be calculated that for a roll 400 millimeters in diameter and 240 millimeters diameter round the neck the speed of rotation should be about 300-350 revolutions per minute for steel rolls and from 400-450 revolutions per minute for cast iron.

The essential differences between this method and the ordinary centrifugal casting method are explained, these being mainly: (1) That in ordinary centrifugal casting the walls of the mold are easily deteriorated; (2) that in centrifugal casting the metal solidifies as it is poured into the mold, which in the case of cylinders weighing as much as 20 tons is an unfavorable factor; (3) for large cylinders, the ordinary centrifugal casting method, with pouring in the center, would necessitate a very high speed of rotation; (4) the process of solidification in the ordinary centrifugal casting method is entirely different from that of the method described in the article, where the mold is only rotated when it has been completely filled with molten metal. In the new method the mold is completely filled with metal and contains no air, and the piping that forms in the center is formed only as solidification is being carried out progressively from the outside toward the center.

In this process it has been found that various defects, such as blowholes, scabs, etc., completely disappear from the useful portion of the

roll. The piping is definitely located in the form of a canal in the center, where it has no detrimental effect, and it can be entirely suppressed by forcing a rod in that canal. Longitudinal heterogeneity is completely eliminated, and the roll is homogeneous throughout its length in any section.

It would seem that transverse heterogeneity would be increased, since there would be a greater tendency toward liquation, but by properly controlling the speed of rotation of the mold, this transverse heterogeneity can be limited in such a way that it is no greater than in the ordinary method of casting rolls. On the other hand, when additions are made to the metal in order to improve its qualities, it is found that the new centrifugal process tends to throw all those additions toward the surface of the roll, thereby improving the characteristics of the useful portion of the roll.

Among the secondary advantages of the process, the following are referred to: (1) the compression of the metal toward the outside portions of the roll; (2) greater elasticity of the roll, due to the presence of the central piping; (3) greater facility for heat-treating, due also to central piping; (4) pure metal obtained by the centrifugal action and facility of eliminating gases; (5) the obtention of a more compact metal devoid of porosities. It was found that steel rolls manufactured by this process had a mean density superior to 7.8. An example is given of a roll manufactured for a blooming mill of 1200 millimeters diameter, having a table 3 meters long and weighing about 30 tons, which gave perfectly good results, and quite a number of rolls of slightly smaller dimensions had been put into normal service and given satisfactory results.

Expansion

Simple Apparatus for the Measurement of Thermal Expansion, by J. W. Bampfylde, *Foundry Trade Journal*, London, England, Nov. 26, 1936.

The article describes an easily constructed dilatometer consisting of two parts, namely a measuring microscope reading to 0.001-millimeter and an expansion apparatus. The expansion apparatus is comprised of a fused silica tube into which a rod of similar material is fitted. The specimen which is exactly 2 inches long and 7/32-inch in diameter is placed in the tube where it butts up against another tube welded into place, and through which the thermocouple is introduced. The specimen is drilled throughout its entire length with a ⅛-inch hole to receive the thermocouple. The rod rests against the other end of the specimen and is held in place with light springs or rubber bands. The exposed end of the rod carries the index for the measuring microscope and the finger for the expansion recorder. The heating element which fits over the portion of the silica tube containing the specimen is a close wound spiral of nichrome wire wound on a refractory tube without any covering.

Manganese Effect

Some Factors Influencing the Production of Sound Castings, by E. W. Wynn and D. Hope, *Foundry Trade Journal*, London, England, Nov. 12, 1936.

In this article the authors discuss briefly various factors which must be controlled to insure production of sound gray iron castings. Those include sand, runners, feeders, solid contraction and composition of the metal. In the latter the authors stress the importance of controlling the manganese content as in their opinion that element has a profound effect on the size of graphite flakes; high manganese leading the large flake formation. To prove their contention, the authors melted approximately 3000 pounds of a base iron in a cupola and transferred it to an oil fired rotary furnace where it was heated for half an hour. Then manganese was added at five minute intervals; test bars and castings being made after thorough mixing of each manganese addition. Original manganese was increased from 0.44 per cent to 1.60 per cent. Physical tests did not show any great change in strength with increasing manganese, but microscopic examination showed increase of graphite flake size with increase of manganese.

Book Review

Engineering Alloys — Names, Properties and Uses, by N. E. Woldman, metallurgical engineer, Eclipse Aviation Corp., East Orange, N. J., and A. J. Dornblatt, professor of metallurgy and chemistry, postgraduate school, United States Naval Academy, Md.; cloth, 600 pages, 6⅛ x 9¼ inches; published by American Society for Metals and supplied by THE FOUNDRY, Cleveland, for $10, plus 15 cents postage; in Europe by Penton Publishing Co. Ltd., London.

Listing 8200 proprietary commercial and technical alloys manufactured in the United States and many made in foreign countries, including England, France, Germany and Sweden, this work satisfies the growing demand for a practical and technical reference book on engineering alloys. This is the most comprehensive compilation ever undertaken and has involved many months of painstaking effort in the assembly, checking and rechecking of information collected from many sources.

The book is devoted to data on the chemical composition, physical and mechanical properties, uses and manufacturers of proprietary alloys. No attempt has been made to include alloys conforming to standard specification analyses as such; examples of the common engineering alloys produced to customers' specifications will be found listed among proprietary alloys. However, because of their widespread usage, specification alloys of the Society of Automotive Engineers, as well as a few others of general interest, have been included.

It was the aim of the authors to present as large an amount of reliable and up-to-date information on commercial alloys as was consistent with convenience in form and breadth of scope of the book.

To facilitate use, the book is divided into seven sections as follows: I—which gives an alphabetical listing of all alloys and their corresponding index or serial number; II—which gives the tradename, composition, properties, uses, general remarks and a key number designating the manufacturer and the reference for each alloy as listed in serial order; III—an index of alloys classified according to typical uses or special characteristics such as corrosion resistance; IV—an alphabetical listing of manufacturers with a summary of the alloys listed that are produced by each; V—which lists manufacturers, with addresses, in serial order according to key number; VI—comprising the references, in serial order according to key number; and VII—an appendix containing useful tables and miscellaneous information pertaining to the properties and testing of alloys.

Some of the 8200 alloys listed are either obsolete or are not in commercial production at present, but they have been embodied in the text to make it as complete a reference as possible. Because of its completeness and authority, this encyclopedic volume will be of great value to all users of metals and alloys.

Milwaukee Men Hear Engineering Talk

George W. Zabel, Fairbanks, Morse & Co., Beloit, Wis., discussed "Engineering and Its Relation to the Foundry," at the Nov. 20 meeting of the Milwaukee Chapter of the American Foundrymen's association, held at the Schroeder hotel, Milwaukee. His talk dealt with the proper design of machinery, the use of various types of patterns and the importance of proper gating. Mr. Zabel emphasized the necessity of a closer co-operation between the engineering and foundry operations. William F. Bornfleth is president of the association.

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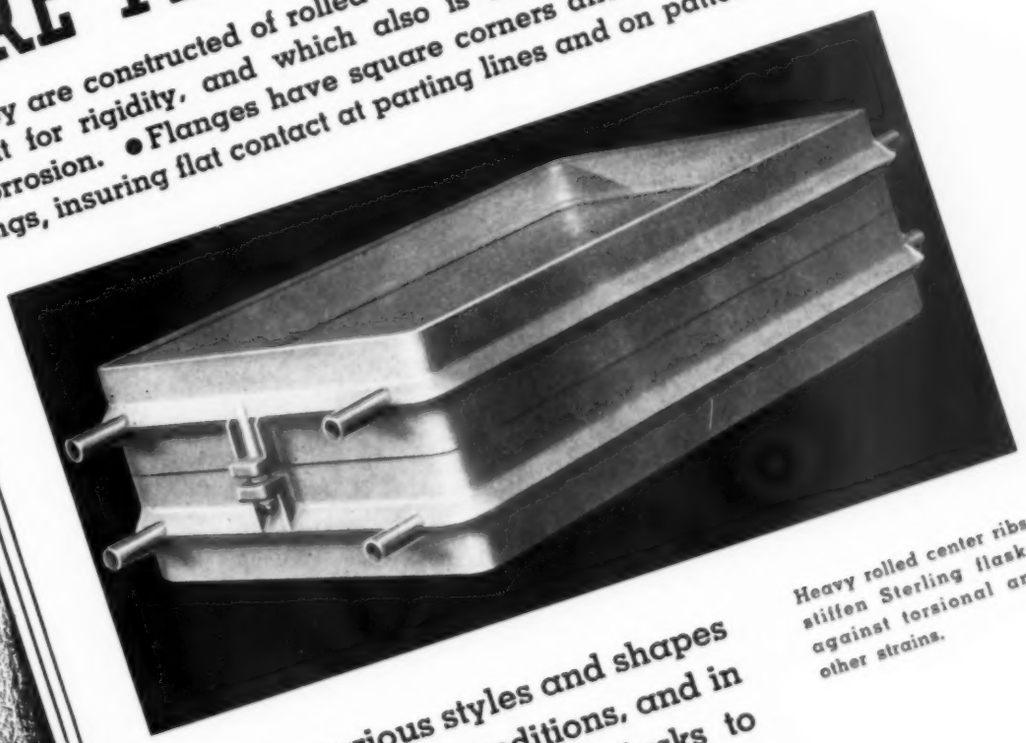

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Caterpillar Trains Founders

(*Concluded from page* 25)

Here he receives instruction on cupola operation and general charging practice, melting and alloying gray iron and semisteel. The work is supplemented with a study of cupola practice and foundry refractories in the class room. The thirty-fifth and thirty-sixth months are devoted to shooting trouble and a general review of previous training in the foundry.

At the completion of this training each boy is given a diploma signed by the proper officials of the company stating that he has completed the course of training as specified in the terms of the apprenticeship agreement. At the completion of this training, each boy is offered a position in the department in which he has shown the greatest aptitude and adaptability. He is transferred from one department to another as soon as he has demonstrated to the company that he is capable of handling a better position to the mutual advantage of the company and himself.

To date, all the boys who have completed this training are still with the Caterpillar company and most of them are holding positions of the better class while three are occupying supervisory positions.

Wage rates in the foundry apprentice division of the Caterpillar school are graded carefully, with advances given every six months, providing of course that the boy is doing satisfactory work. During the first 6 months he receives 39 cents an hour. This is advanced to 45 cents during the second 6 months, 50 cents during the third, 55 cents during the fourth, 60 cents during the fifth and 66 cents during the sixth and final half year period. During the 3-year period the boy is in training the company has paid the apprentice a total of $3276.00. When the boy goes into the plant upon graduation, he starts at a wage rate of 72 cents an hour. Instructors in the apprentice school follow the boy for 6 months after graduation to see that he is making progress commensurate with his capabilities, and that he receives a wage increase at the end of the period if deserved. If not, the instructors try to correct any difficulties which may have developed.

Those connected with the apprentice program feel that the training of skilled labor is a very worthwhile undertaking and especially so in the light of the serious shortage of skilled labor.

Boys Selected Carefully

Forty-six boys of the higher type are in the foundry division learning the foundry trade in all its branches. To date, there are 525 young men in training at the Caterpillar plant for the different trades in the metal industry. Through careful selection the turnover has been cut to about 10 per cent and each year a better class of young men is being attracted. Also, the course is becoming more complete each year.

If an ambitious young man is shown that he can learn a worthwhile trade in all its branches and in the end be given an opportunity to pursue his trade in pleasant surroundings, there is no reason why he will not develop to his fullest extent and be a credit to himself, the company he works for, and a good responsible citizen in his community.

Plan Conference at Michigan State

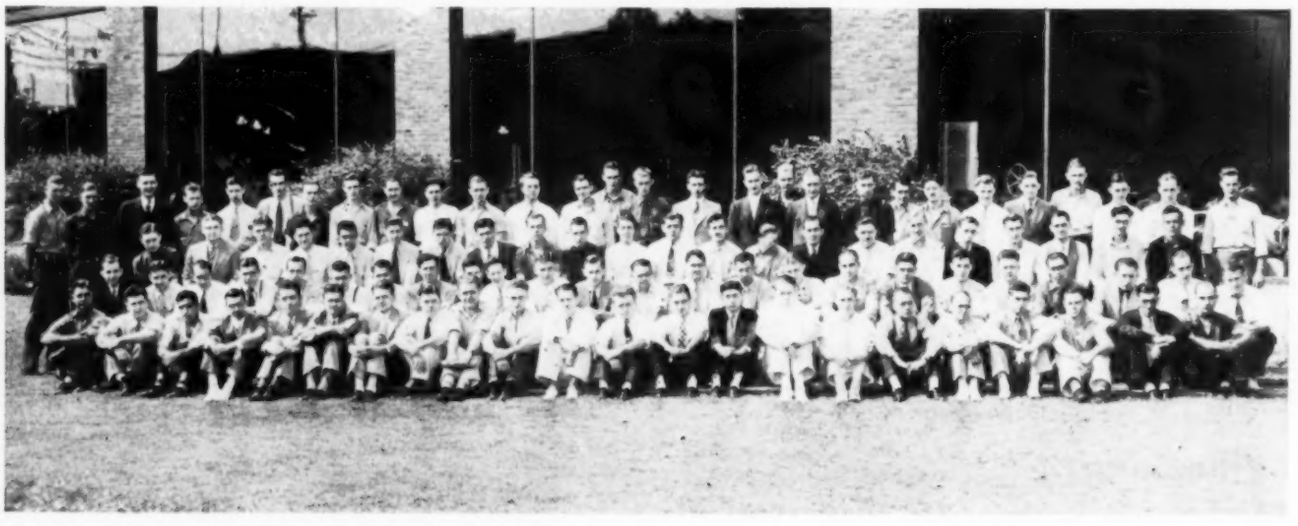
The next annual two-day foundry conference at Michigan State college, East Lansing, Mich., sponsored by the Detroit Chapter of the American Foundrymen's association, the college and the A. F. A. has been scheduled for April 9 and 10. The educational committee of the Detroit chapter has planned the subject schedule for the meeting sessions as follows: Friday morning, the testing of metals with particular regard to cast iron; Friday afternoon, the adaptability of gray iron as an engineering material; and Saturday morning, a revolutionary idea in Michigan molding sands, and core making. A dinner will be held Friday evening.

Jersey Group Hears Talk on Ingot

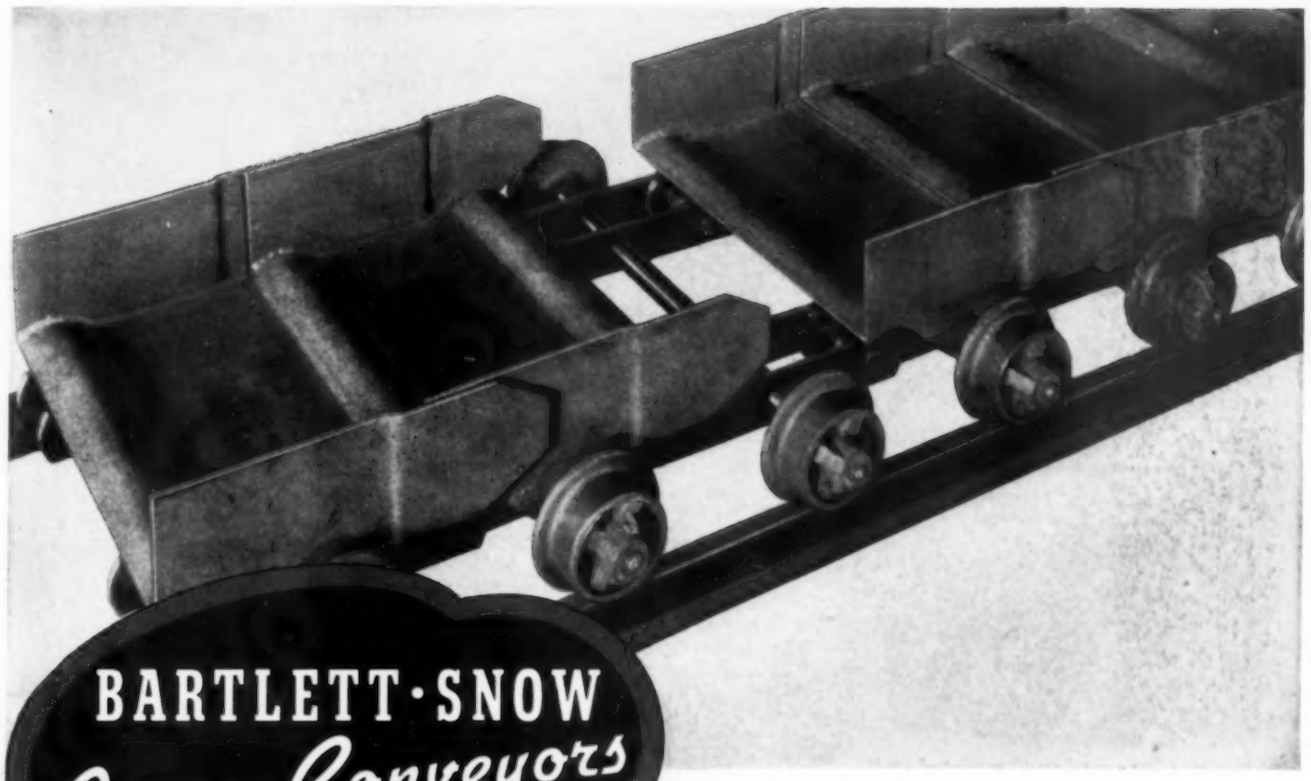
The regular meeting of the North Jersey Nonferrous Founders association was held Nov. 19 at the Essex house, Newark, N. J., including a dinner and the second of a series of technical discussions. William Kelly and W. N. Jacobsen, Nassau Smelting & Refining Co., New York, headed the evening's program.

Speaking on the subject of "Ingot Metal Problems in the Nonferrous Foundry," the two speakers described the process of manufacturing ingot metals, the application of various compositions and the problems involved in the use of scrap. Various types of casting defects, possible causes of these defects, such as incorrect melting practice, faulty foundry technique, etc., were other major parts of the speech.

A discussion of the effect of recent material increases in metal prices is planned for the future.



A recent photograph of apprentice graduates now employed at the Caterpillar plant



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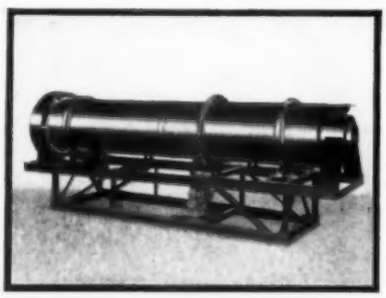
. . . that a straight line is the shortest distance between two points. They carry long stretches—straight as a die—without wind or weave . . . incur a minimum of wear . . . and a much reduced power requirement.

Each pan with its stiffening beads and leak proof ends transmits the entire weight of its load to its own axle and wheels . . . and can be removed from the assembly without disturbing even the adjacent pans. The chains are used only to join the pans, and pull them along together. They experience none of the load, thrust, or other forces that cause breakage, transverse sway, and excessive wear in conveyors of less exacting design.

Bartlett-Snow Apron Conveyors are but one of the equipments designed and built by Bartlett-Snow specially for foundry service. They reflect the efficiency of a construction based on 25 years' first hand experience in solving the problems encountered in actual rather than theoretical operation . . . and suggest the obvious advantages of referring your foundry problems to the Bartlett-Snow foundry engineers. What are your problems?



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Patents Applied for and Pending on These Ladles

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DEPT. 126

PORT WASHINGTON, WIS.

MODERN EQUIPMENT CO.

Correlating Service Needs

(*Concluded from page 27*)

Diameter	Surface Brinell	Center Brinell
1 inch	601	578
2 inches	555	514
3 inches	534	477
4 inches	495	429
5 inches	461	401

When the 461 brinell of the surface and the 401 brinell of the center of the 5-inch section of the chromium-molybdenum steel is compared with the outside and center of the same section of the plain steel similarly quench, it can be seen readily how important it is to choose the proper steel to obtain the desired hardness results under given conditions of heat treatment. What holds for water quenching applies to any other form of cooling whether it be oil, accelerated or still air. The only difference is in the rate of cooling, which of course determines the hardness.

The example of an alloy steel which will respond to quick cooling and produce a satisfactory hardness is only one of many combinations of elements which will produce similar results. Many elements assist carbon in this respect. Of these, combinations of chromium, nickel, molybdenum, vanadium and manganese are used most commonly and the selection depends primarily upon the most economical mix which will produce the desired results, in a dependable manner, with the facilities at hand. At this point it should be mentioned that vanadium or molybdenum should not be used alone as a hardener in steel since they may even lower the hardening properties. However, in combination with other alloys they are very effective.

Table I

Results in Improvements

Yield Point lb. sq. in.	Ultimate Strength lb. sq. in.	Elongation Per Cent	Red. of Area Per Cent	Brinell Hardness
59,750	88,400	30.0	56.0	229
73,700	100,000	25.0	59.7	...
67,500	93,850	26.5	56.0	...
80,500	97,000	25.0	52.0	229

Treatment

Normalized: Time, quench in water, followed by air cool, and tempered.

Often it is desired to harden only certain parts of steel castings which are subjected to excessive wear or abrasion. This can be accomplished by selective hardening. Torch or flame hardening is a notable example of this type and consists of locally heating the parts above the critical temperature with an oxyacetylene torch and immediately flooding the part with water. Another much used method is to heat the entire casting above the critical temperature, submerging only the parts to be hardened in water. Other well known methods are case hardening, surface coating and nitriding, all of which have typical applications.

Elements Affect Hardness

Hardness in iron is produced chiefly by reducing the graphitic carbon or at least having it in a nodular and finely divided state. Sulphur which increases the stability of the carbides, thus inhibiting graphitization, has been used extensively for many years. Carbide forming elements such as chromium, molybdenum and manganese are used with satisfactory results. Nickel also is a hardener of iron by means of a refined matrix; low percentages make for a finer pearlite, higher percentages change the pearlite to sorbite to troostite-sorbite and martensite. Most of the super-hard chilled rolls depend upon nickel to make a hard fine grained matrix, to assist the carbides in producing the desired hardness.

Next to hardness, strength is probably the most important characteristic of a steel or iron casting. Strength of steel and iron usually is measured by the force required to stretch it beyond its elastic limit. This point is referred to as yield point. The force required actually to pull the metal apart is known as the ultimate tensile strength.

In general, strength of steel or iron increases with a decrease in ferrite. Also in general, strength in steel increases with increase of carbon up to the eutectoid. Unfortunately, however, ductility decreases with both a decrease in ferrite, and an increase in carbon, so that in choosing a steel which will have the proper strength for the service requirement it is necessary to know whether it will have sufficient ductility.

With a given analysis the strength of a piece of steel can be changed materially by heat treatment. What this heat treatment produces is really a very intimate association between the pearlite and ferrite, and if the constituents of the pearlite (ferrite and cementite) are even more intimately associated, a sorbite is produced which has a proportionately higher strength than pearlite.

Many elements contribute to increased tensile strength in steel among which might be mentioned manganese, nickel, chromium, molybdenum and silicon. The latter up to 2.50 per cent is said to raise the ultimate tensile strength without sacrificing ductility. (Silicon dissolves in iron matrix). The extent to which any one or a combination of these, affects the strength of a steel casting, depends almost entirely upon its carbon content and the type of treatment utilized.

In irons the strength depends to a large extent upon the relationship between the graphite and combined carbon. Size and distribution of the graphite and alloying elements also are important factors.

Today, iron of high strength is being made regularly, usually with the addition of small amounts of alloying elements, nickel, chromium, and molybdenum. One mixture which finds favor contains 2.75 to 3.15 per cent total carbon; 0.60 to 1.0 per cent manganese; 0.90 to 1.10 per cent silicon, and 1.00 to 1.25 per cent nickel. That iron has a tensile strength from 37,500 to 46,100 pounds per square inch; a transverse strength from 4650 to 5540 pounds on 12-inch centers, and a brinell hardness from 220 to 240. Another mixture shows 3.07 per cent total carbon; 0.55 per cent manganese; 2.22 per cent silicon; 0.26 per cent chromium, and 0.40 per cent molybdenum. The tensile strength is 47,080 pounds per square inch; transverse strength of 4860 pounds on 12-inch centers, and 235 brinell hardness.

Made Representative

John Brooks & Co., Montreal, Que., has been appointed district representative of the Cleveland Quarries Co., Cleveland, and will handle that company's line of silica firestone and other products in the territory east of Kingston, Ont., Province of Quebec, Nova Scotia and New Foundland.

Table II

Effect of Vanadium

Yield Point lb. sq. in.	Ultimate Strength lb. sq. in.	Elongation Per Cent	Red. of Area Per Cent
56,450	86,850	27.5	55.7
61,950	88,500	27.0	55.2

Analysis: Carbon, 0.40 per cent; manganese, 0.75 per cent; silicon, 0.33 per cent, and vanadium, 0.23 per cent.

Heat Treatment: Double normalized and tempered.

From strength we shall pass to ductility. These two properties, strength and ductility, rather tie together, different as they may be. We are not satisfied to know only the strength of a steel, but invariably inquire as to its ductility. Inasmuch as cast iron in general does not lend itself to ductility we shall confine the discussion to steel.

Ductility in foundry parlance usually means elongation, reduction of area, and ability to cold bend. These terms and the method of determining them are well known, therefore we shall immediately give some consideration to aids in securing results adequate to meet specifications, or withstand service requirements. As mentioned previously, an increase in carbon, which results in a decrease in ferrite, normally means lowered ductility. To lower the carbon excessively and thus increase the ductility is not good practice, since such a procedure definitely lowers the strength. What then is the answer. As usual we turn to one or both of two items, namely heat treating and alloys.

Ductility on Hard Castings

To obtain good ductility, it is necessary to have a fine distribution of ferrite and pearlite. Even if the carbon is permitted to go to the range considered only desirable for *hard* classifications of steel castings, with proper heat treatment the elongation and reduction of area can be raised surprisingly high, and along with the high ductility will be strength properties normal to the carbon range. As an example the physical properties shown in Table 1 on a steel containing 0.42 per cent carbon; 1.30 per cent manganese; 0.38 per cent silicon; 0.029 per cent phosphorus, and 0.029 sulphur, show results obtained from coupons treated as a unit part of a load of commercial castings.

Similar high ductilities in steel castings can be obtained by using an alloy or combination of alloys in which event a less complicated heat treatment is necessary to obtain the ductility and still maintain a commendable strength. Alloys in common use are nickel, vanadium and molybdenum. Reference to various publications will show a mass of data verifying that statement. For example, Jerome Strauss in discussing vanadium in steel castings—*Transactions*, American Foundrymen's association, 1933 presented the results shown in Table II as being obtained from the corner of a 5½-inch, cast steel section.

In a pamphlet issued by the International Nickel Co. on properties and uses of nickel alloy steels the following results were obtained from coupons treated integrally with the castings: Yield point, 62,450 pounds per square inch; ultimate strength, 100,000 pounds per square inch; elongation, 24.5 per cent, and reduction of area, 49.2 per cent. The steel contained 0.43 per cent carbon; 1.38 per cent manganese; 0.37 per cent silicon, and 1.34 per cent nickel. The steel was normalized and tempered.

Addition of molybdenum according to a bulletin issued by the Climax Molybdenum Corp. shows the following: Yield point, 67,990 pounds per square inch; ultimate strength, 96,440 pounds per square inch; elongation, 25.5 per cent, and reduction of area, 57.5 per cent in a steel containing 0.33 per cent carbon; 1.60 per cent manganese, and 0.35 per cent molybdenum. The product was normalized at 1650 degrees Fahr., and tempered at 1250 degrees.

These results are not exceptional and are mentioned only to show that it is more or less up to the individual foundry to choose its preferred analysis, and treatment to obtain the desired results. There are many good combinations, but it is difficult to even suggest which is better, and impossible to definitely say which is best. One point should be mentioned with reference to ductility of steel which has to do materially with its manufacture, and that is its cleanliness or freedom from an excessive amount of oxides and sulphides. Invariably this condition will reflect itself much more in the ductility tests than in the strength tests and especially is this true if the inclusions have had an opportunity to coalesce and segregate in large globules.

Machine Progress Is Traced at Boston

Two speakers featured the program of the regular monthly meeting of the New England Foundrymen's association held Nov. 13 at the Engineer's club, Boston. William P. Laytham, president, William P. Laytham & Sons Co., Paterson, N. J., and Michael McGuire, foundry consultant, George F. Pettinos Co., Philadelphia, gave a joint discourse on the subject of "The Mechanized Foundry."

Calling on the background of his experience, Mr. McGuire discussed modern methods of cupola melting, paying special attention to blast control and mechanical charging. He pointed out that these two improvements have contributed to the uniformity of products and have bettered melting conditions. The speaker discussed modern methods of molding and described in detail such improvements as gang core boxes, conveyors and automatic shakeouts. In his reference to pouring, Mr. McGuire showed that in some cases mechanical ladle lifting was in use for ladles as light as 60 pounds and mentioned the fact that many foundries have found this advance in pouring methods profitable. One pourer for several floors is better than one for each individual floor according to the speaker. Mr. Laytham spoke on the costs of installing and operating equipment described by the first speaker.

With A. S. Wright presiding, it was pointed out that there were eight past presidents of the association present at this meeting. Following dinner, A. B. Root reported for the committee on the reduction of insurance premiums.

Discuss Aluminum At Cleveland

H. J. Rowe, technical control and development engineer, the Aluminum Co. of America, Cleveland, presented various interesting features on the subject of "Founding Aluminum Alloys," Nov. 12 at the regular meeting of the Northeastern Ohio Chapter of the American Foundrymen's association. His talk was given at the Cleveland club with approximately 90 men attending.

Mr. Rowe opened his discussion with a brief historical reference concerning the discovery of the electrolytic process for the manufacture of aluminum. He stated that aluminum alloy castings possess certain physical factors such as light weight, corrosion resistance, high thermal conductivity and electrical conductivity, which make them highly desirable. Three important characteristics affecting foundry practice applied to aluminum alloys are low specific gravity, hot shortness and high crystallization shrinkage, he said. Placing alloys in two divisions, common and high-strength, the speaker stated that the first is made by straight alloying and the second by heat treatment. Various types were discussed. The use of suitable sand in alloy production, gating, the use of chills and control of pouring temperature were important parts of Mr. Rowe's well-conceived talk.

Frank G. Steinebach, chairman of the chapter, announced the January meeting will provide a symposium on the use of alloys in cast iron. He also stated that 20 new names had been added to the sizable total membership since the beginning of the season. G. F. Leroux, chairman of the program committee, provided a "mechanized" coffee talk on "Men and Machines," through Vocafilm, a picturized answer to the idea that machines take away jobs.

S. O. Otrich Co., San Francisco, has been appointed sales representative of the Stearns Magnetic Mfg. Co., Milwaukee.

"I'll say they're easy to handle"

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Southern Pig Iron in standard form, produced by Tennessee Coal, Iron & Railroad Company, Birmingham, Ala., is also available for shipment throughout the North and South.

UNITED STATES STEEL

Cast Iron For Enameling

(*Continued from page* 29)

will be higher in ash and sulphur than by-product coke which has greater density. A decided advantage is gained from the use of material from more than one source, and it is suggested that two cokes, of markedly different character be used, being careful to control each type chemically as to ash and sulphur content. An excellent combination is: by-product coke from one source, low in sulphur and beehive coke, as large, porous and strong as possible, held low in ash, from another source. Analyses may be as follows:

By-product coke: Sulphur — 0.50 to 0.60. Ash — 6 to 7.5 per cent.

Beehive coke. Sulphur — 0.90 to 1.10. Ash—10 to 11 per cent.

The cupola bed may be beehive coke, and that between the charges may consist of by-produce and beehive in equal amounts.

High-grade limestone, containing over 96 per cent calcium carbonate should be used. Fluorspar, or proprietary fluxes of unknown composition are not recommended, since an unknown and uncontrollable variable is likely to be introduced. Certain proprietary fluxes, if analyzed and the composition definitely known, may be used after a careful study and trial.

Soda Ash Is Employed

A valuable auxiliary flux is fused soda ash. This material makes the slag more fluid, and consequently cleans the iron more thoroughly. Part of this cleaning action is the removal of some sulphur from the iron and thus a partial control of the amount of sulphur in the final castings is provided.

Melting installations now in use range from the very oldest cupola shells with ordinary fan blowers, to the most modern installations with controlled humidity, temperature, volume and pressure regulation of the blast. They vary from the smallest to extremely large, fast-melting devices.

In general, a cupola designed for melting heavy material (dense metal charges and dense coke) has a single row of tuyeres, no bosh, and is operated under comparatively high pressures with a moderate volume of air. The melting zone in such practice will be comparatively narrow, and it will not be usual to slag heavily. Usually, the slagging is done from the back. These installations run quietly, with no flame at the charging door.

A cupola which melts light material, if a reasonable melting speed is to be obtained. will have two rows of tuyeres, may or may not be boshed, will be operated with a comparatively large volume of air, at low pressure, will be heavily slagged (preferably at the spout) and will have a wide melting zone. Considerable flame will appear at the charging door at all times during the heat.

The former type of furnace is capable of closer control; but, perhaps unfortunately, it is with the latter type that usually we are called upon to deal.

Know Oxygen Amount

With either, we should be certain of the volume of air passing through the cupola per unit of time, or preferably, since oxygen is the active element in combustion, the number of pounds of oxygen delivered to the cupola per minute. A blower of the constant volume type, preferably with a variable speed motor, should be available. In event that the motor is constant in speed, the output of the unit should be more than the maximum required. Control is accomplished by bleeding the line with an adjustable valve. An accurate volumeter should be installed between the valve and the furnace. The proper installation of the volumeter is not easy, and should be supervised by the maker of the instrument. There should be an accurate pressure-gage in the line, and a thermometer.

This equipment shows the volume and pressure of air entering the wind chamber. The number of pounds of oxygen delivered per minute may be found in an appropriate table or calculated, for any given air temperature.

Humidity of the air exercises a definite influence, since the water in the air must be heated to the furnace temperature along with the nitrogen, carbon dioxide and other inert gases, and the more water there is present the less heat there is available for melting the charge. Certain of the more modern installations have an apparatus for determining and permitting one to increase or decrease the humidity.

Preheating the blast furnishes a certain amount of heat for the melting in itself, which somewhat reduces the amount of coke to be burned per charge, but necessitates a compensating increase in the volume of air delivered to the furnace to counteract the rarefying effect of the increase in temperature.

The value of these instruments and equipment lies in the ability to reproduce exactly conditions once established by experiment. The equipment always should be kept in good condition; continuous records being made throughout each heat by some responsible person.

To give the slag the maximum opportunity to wash the iron, it is recommended that a spout of the slagging type be used. This is applicable to the continuous pouring customary in stove foundries. If tapping is intermittent, the slagging necessarily will have to be done at the back of the furnace.

To remove as much slag as possible from the iron before it is received in the hand ladles, a large mixing ladle of the teapot type is a necessity.

The sole function of the cupola furnace is to melt the metal charge in a way to preserve the properties of the materials used and to deliver the molten iron to the floor in the best possible condition for casting.

Hot Melting Is Necessary

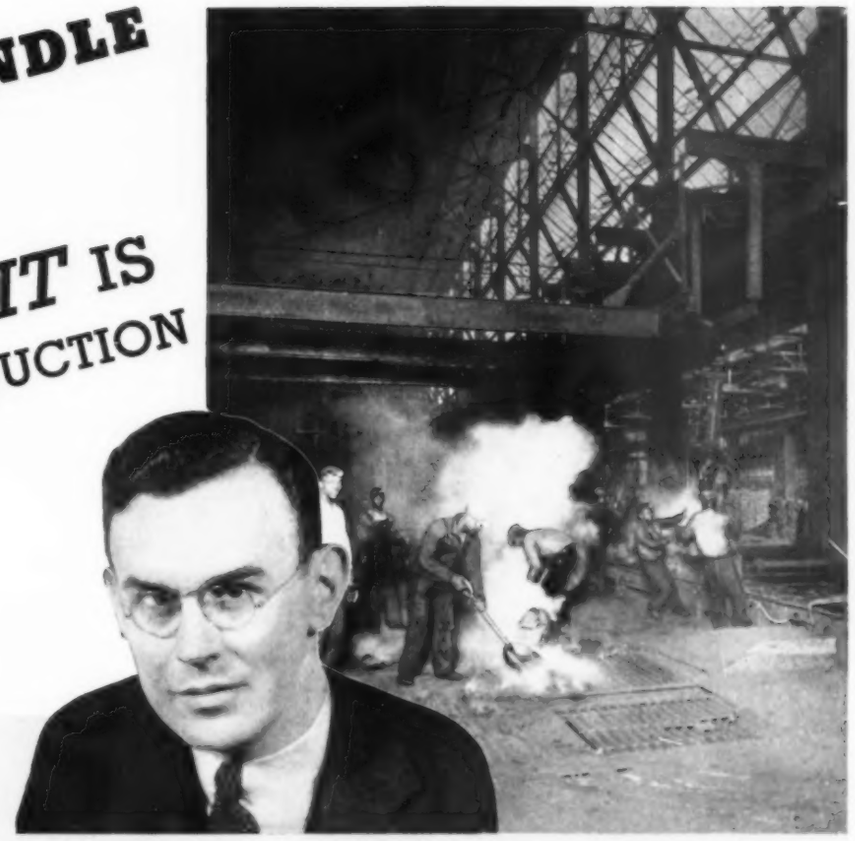
The iron will come out much cleaner and in better condition if melted as fast and as hot as possible. Hot melting depends primarily upon having the bed coke exactly the proper height above the tuyeres, and the addition of exactly enough coke between charges to preserve its height as the metal melts throughout the heat. This exact height usually is specified by the manufacturers of the cupola and can be checked by observance of the line left around the melting zone after the first heat. Once the height is determined, the bed should not be made by putting a certain weight of coke upon the bottom, but by accurate measurement from the sill of the charging door.

During the heat, if the iron seems to become colder, either not enough, or too much coke is being added between charges. When the bed drops during the heat, the iron is likely to become oxidized, since the blast will not have passed over sufficient coke to combine with all the oxygen present. Such iron will not pour with proper fluidity, will be porous, and will have too much iron carbide in its metallographic structure. If too much coke is being added, the cupola becomes to some extent a gas producer, and much of the coke will be burned only to carbon monoxide, thus losing considerable efficiency.

To have clean iron the cupola should be heavily slagged with slag as fluid as possible. Introduction of the slag, while necessary, has a certain influence on the melting which must be taken into account. It takes heat to raise limestone and other fluxes to the melting temperature and therefore the more slag-

(*Continued on page* 77)

HOW TO HANDLE IT IF IT IS INCREASED PRODUCTION



HOW REX SOLVED THIS PRESSING PROBLEM IN ONE FOUNDRY AND SAVED $160.00 PER 1000 CASTINGS

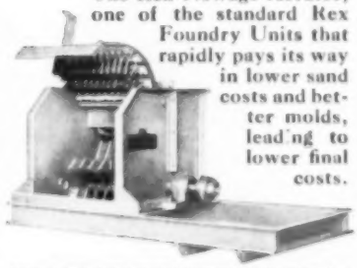
● In this foundry 22 molders and 6 men pouring off were producing 600 castings per day. Increased production demanded that this be increased to 1300. This would mean the addition of 26 molders. Times were active and 26 molders were not to be had.

A Rex Foundry Sand Conditioning System was installed. 29 molders, 5 men pouring off, 11 shakeout men and 2 maintenance men handled the job. This was a total of 47 men, or only 19 more than produced the 600 castings—and 5 of them were secured from the night shift that previously conditioned and tempered the sand.

The work of labor was made easier and more productive. The manufacturer made a gross saving of $160.00 per 1000 castings.

Any foundry, jobbing or production offers like opportunities by the use of Rex Foundry Handling Equipment. Mechanical handling and sand conditioning are frequently the answer to the present problem of a scarcity of molders, coupled with shorter hours and increased production.

It will cost you nothing to have a Rex Engineer go over your foundry problems. He will call on request.



The Rex-Newago Aerator, one of the standard Rex Foundry Units that rapidly pays its way in lower sand costs and better molds, leading to lower final costs.

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Firm Name .....

Address .....

City ..... *State* .....

Type of Foundry .....

Daily Average Production ..... Tons

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Molds can be made on Milwaukee and Davenport Machines with the Fewest Motions and Operations.

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MILWAUKEE FOUNDRY EQUIPMENT CO.

3238 West Pierce St., Cable Address "Milmoldco"

MILWAUKEE, WISCONSIN

(*Continued from page* 74)

ging materials are introduced, the more coke must be burned, and the faster it must be burned to attain a given temperature. This means that the heavier the cupola is slagged, the more coke must be burned between charges.

Slagging should be started as soon as possible after the blast is turned on, and therefore the order of placing the materials in the cupola becomes of importance. The best order is to place the limestone and soda ash directly upon the bed, next the metal charge, and last the the coke. If the cupola is used for melting light material, and has a bosh, most of the heat will be found near the edges. It is well to place the heavier pieces of metal in that position, allowing the lighter metal to fall in the middle. This practice also makes for even distribution of the blast since it reduces the resistance to the passage of air through the middle of the cupola.

Size of the charges should be neither too large nor too small. A good proportion and size for a 66-inch cupola would be:

Metal	3,000 pounds
Coke	330 pounds
Limestone	80 pounds

To this may be added 8 to 12 pounds of fused soda ash to produce the proper fluidity in the slag and to influence the retention of sulphur in the iron, or its removal as desired. Too large a metal charge has the effect of alternately lowering and raising the coke bed between too great limits, causing alternately oxidation and loss of melting efficiency, while too small a charge does not present a sufficient bulk of metal to the melting zone at a given time for efficient melting, to say nothing of the extra labor involved in preparation of the many small charges.

Temperature of iron flowing from the cupola spout should be checked at frequent and regular intervals by an optical pyrometer.

Structure Is Mainly Pearlitic

For porcelain enameling purposes, the structure of the ⅛-inch casting should be mainly pearlitic, and should show some ferrite. No iron carbide should be in evidence. This structure means that the iron is as strong as possible, dense and easily machinable. It also means freedom from warpage and shrinkage. Warpage and shrinkage may be expected if the structure of the casting shows any cementite.

To check this point for each new mix, it is recommended that inch-square bars be cast in pairs as follows:

One pair from the first round of the heat.
One pair from the second round.
One pair from the middle of the heat.
One pair from the last round.

These bars, 13 inches long, are cast in dry sand molds and are used for measuring structure, deflection, transverse breaking-strength and chemical analysis.

To check the structure, a section is sawed from one of the bars cast from the middle of the heat. It may be turned down to a cylinder ¾-inch diameter and ½-inch high. One face of the cylinder is polished, etched (alcoholic picric acid) and examined under the microscope. The structure should be practically all ferrite and finely divided graphite, in the characteristic whorl formation. This will insure that the iron will produce the desired structure in the light-section castings. If cementite is present in the 1-inch square bars, the iron likely is totally unfit for enameling. It is recommended that this structure be checked for each new mix, and certainly with the introduction of each new car of pig iron or scrap.

Bars Show Deflection

All eight bars from each heat should be broken on 12-inch centers in a suitable machine where the deflection at various loads may also be measured. Iron which has much oxygen, too much sulphur, or much iron carbide, will show too low a deflection at breaking, although it may be quite strong. A deflection at breaking of 0.14-inch to 0.18-inch may be expected from suitable iron.

The bars should break between 2800 and 3200 pounds load. Bars cast from the first round of the heat will break with less load than those cast from the other rounds, and show less deflection. Usually the iron from the first round is used to wash the ladles, and is pigged, but the second round should show marked improvement, and the middle of the heat should be perfectly normal. The following table illustrates the usual breaking characteristic of a set of four pairs of 1-inch square bars:

	A	B	Avg.
1st round	2800	2830	2815
2nd round	2950	2920	2935
Middle round	3050	3100	3075
Last round	3120	3060	3090
Grand average, pounds			2980

If the breaking strength of the bars seems too high it is usually an indication that the iron is too soft, too low in sulphur, and that warpage may be expected in the enameling furnace. If the bars are weak, either hardness or coarse structure accompanied by weakness is indicated, with probably impaired enameling characteristics.

There is a wide diversity of opinion as to the chemical analysis which will produce the best results in castings to be porcelain enameled. However, several principles seem pretty definitely established.

Iron low in silicon usually is very difficult to enamel. Foundries having the best porcelain enameling results usually will be found making iron which contains at least 2.50 per cent silicon and our own experience indicates that even this is too low. The safest point seems to be 2.60 per cent to 2.70 per cent, either the high or low limit to be used, depending on the amount of returns and scrap in the mix. The higher the percentage of pig, the lower the silicon content which safely may be carried.

Another very desirable feature of enameling iron is freedom from porosity, which is never attained without the use of sufficient manganese. Here again the more pig used, the lower is the manganese content which safely may be carried, but it should range from 0.65 to 0.70 to produce proper density.

Pouring at comparatively low temperature is possible if the iron is sufficiently fluid. High carbon and fairly high phosphorus are necessary for fluidity. The phosphorus will be best 0.70 per cent or over, the carbon content being governed by the amount of silicon in the castings. Abnormally low carbon is cause for suspicion that something is radically wrong in the melting.

The castings themselves normally (as a consequence of their pearlitic structure) should show about 0.4 to 0.5 per cent combined carbon, with the rest as graphite. The inch-square bars will show 0.10 to 0.15 per cent combined carbon when this is the case.

May Control Sulphur

By variations in the amount of soda ash used as an auxiliary flux, and by varying the proportions of byproduct and beehive coke, the sulphur in the castings may be controlled closely. It is quite possible in a cupola furnace to make cast iron which contains less than 0.04 per cent sulphur. However, this kind of iron is almost certain, given the proper silicon content, to warp in the enameling furnace. It may even be bent in the hand. Since the silicon content should be maintained, it is necessary to have slightly more sulphur in the castings. Too much sulphur is highly objectionable, since its presence promotes porosity, brittleness and general weakness in the iron.

Given the desired silicon content, the minimum amount of sulphur which will stiffen the iron enough to prevent warpage in the enameling furnace is about 0.065 per cent, and to be on the safe side 0.075 is recommended.

From the foregoing, it will be seen that an average analysis of cast iron

suitable for enameling purposes would be about as follows:

	Per cent
Silicon	2.65-2.70
Manganese	0.70
Phosphorus	0.70-0.75
Sulphur	0.075
Total carbon	3.55
Combined carbon	0.45
Graphite	3.10
Alloys	None

The chemical analysis of each heat is made from drillings taken from the bars cast from the middle round of the heat.

This chemical analysis will be the same as the castings themselves with the exception of the carbons. The total carbon, of course, will be the same, but there will always be found more graphite and less combined carbon in the 1-inch sections than in the ⅛-inch sections of regular castings. If the combined carbon in the bars runs between 0.10 per cent and 0.15 per cent that in the castings will be found to be usually 0.40 to 0.50 per cent, which is as desired. Drillings should be taken from time to time from ⅛-inch sections to verify this.

Must Allow For Losses

Previously reference was made to the calculation of the resultant iron from a heat from the raw materials involved. Normally speaking, if melting practice is good, 0.25 per cent of the silicon and 0.10 per cent of the manganese will be lost in the slag. These losses must be allowed for. Also, there will be a pickup of sulphur of 0.03 per cent or so depending upon the amount of sulphur in the coke, and the amout of soda ash used. By varying these materials the pick-up of sulphur may be altered from about 0.015 to 0.05, but these would be extreme efforts, and the normal pickup will be regarded as 0.03 per cent.

The analysis aimed for in our calculation, therefore, would be as follows:

	Per cent
Silicon	2.90
Manganese	0.80
Phosphorus	0.70
Sulphur	0.045

No account is taken of the carbons, since their amount depends on other variables. For calculation purposes assume the use of 50 per cent foundry returns and no scrap in the mixture and use the pig iron analyses from the first section as they may be required. Method of calculating the mixture is shown in the accompanying table.

While extremely hot melting favors the production of clear, dense iron, just the reverse is true of pouring temperatures. High pouring temperatures will cause sand to burn into the casting surface, with accompanying oxidation. It will cause excessive washing away at the gates, favoring local porosity and sub-surface holes, which may or may not be opened by sandblasting.

Sudden chilling of the surface from high temperatures favors the formation of a skin of iron carbide, as well as excessive internal shrinkage, producing an interior structure analogous to a fast frozen cake of ice.

Somewhat the same effects may be caused by the use of sand which contains fusible material or is too soft. Sand molds of too high moisture content produce similar unfavorable results.

Facings of inert and infusible material do no harm if sparingly used, but the employment of graphite or carbon facings as a protection against washing by hot iron inevitably will lead to trouble.

A combination of very fluid iron, hard infusible sand of low moisture content, small amounts of inert facing where necessary and low pouring temperature, will enhance greatly the enameling properties of the castings.

As an aid to filling the mold quickly, and keeping out any remaining slag, plenty of wide, knife-edge skimming gates should be used on all match plates and loose patterns.

Preferably the surface to be porcelain enameled is down when the iron is poured; any remaining impurities in the iron will then tend to rise away from the good surface.

Castings for enameling should never be shaken from the mold while red hot, but should be allowed to cool slowly in the mold. On the other hand, the shaking out must take place before the castings are cool enough to absorb moisture from the mold; otherwise internal rusting will occur, which nothing short of annealing at high temperatures can neutralize.

Castings may be given a preliminary cleaning in a tumbling barrel or on a sandblast table. They are then rough ground to remove sharp edges where gates have broken off or where the mold has shifted slightly.

Too much emphasis cannot be placed on storage conditions. Castings which stand in damp cold places lose their good enameling qualities due to absorption of moisture. Warm dry atmosphere is necessary for their proper preservation.

Machining should be done dry and castings should not be handled with oily hands or gloves.

Final blasting is accomplished either by hard, sharp sand or metal abrasive, mixed with sand. While sand seems to give the best results from an enameling point of view, mixtures of sand and grit are being used in some shops with enough sand in the mixture to keep the grit clean and free from dirt and rust. The utmost precaution must be used to keep water and oil out of the airlines from the compressor to the sand blast.

Every compressor should be equipped with an efficient after-cooler. It is also highly advisable to have a couple of large and very efficient filters in the air line. Both the filters and the after-coolers should be bled at frequent and definite intervals, preferably twice a day in warm weather.

Castings should be enameled at the earliest possible moment after cleaning and in no case allowed to stand longer than overnight. If it is necessary for a lot of castings to remain overnight before enameling, they should be stored in a warm drier, at a temperature to keep them from absorbing moisture.

General principles of manufacture once established, the essence of successful manufacturing is control. The history of the development of porcelain enameling from an art to a commercial finish has been the development and application of control methods. Modern porcelain enamels, even in spite of the excellence of formulas, owe their consistent working qualities and appearance largely to a rigorous control from raw material to shipment. Modern enamel shop practice resolves itself largely into a control of details.

This article originally appeared in the October issue of the Enamelist, and is reproduced here through the courtesy of that publication.

The Editors.

New Company Makes Scrap Briquets

Nu-Scrap Briquetting Co., 219 South Sixteenth street, Milwaukee, recently has been placed in operation by E. J. Byerlein, who is also president of the Milwaukee Foundry Equipment Co. The new company purchases borings from sources throughout the district and produces briquets to be sold. The company is producing 20 tons of briquets daily

Personnel Change

P. B. Engstrom has been appointed distributor in Los Angeles and southern California territory, for the Link-Belt Co., Chicago. His headquarters will be in the company's Los Angeles office. B. Howard MacNeal has been transferred from Memphis, Tenn., to the company's office in Philadelphia. Edward F. Carey represents the company in Philadelphia and Chester S. Lewis in New York.

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SNAGGING WHEELS
IT'S action you want in the foundry cleaning room—wheels that will fairly "eat" off metal—wheels that combine fast cutting with long life. And getting this combination simmers down to just one thing—fitting the wheel to the job. It means a wheel of Alundum or Crystolon abrasive, vitrified, resinoid or rubber bond, the correct grain size, grade and grain spacing. This last feature, grain spacing, is especially important in snagging wheels—can be had as a result of CONTROLLED STRUCTURE, that patented Norton development. To help you get the right wheels for your job there are Norton engineers who specialize on foundry grinding. Their experience is available to you.
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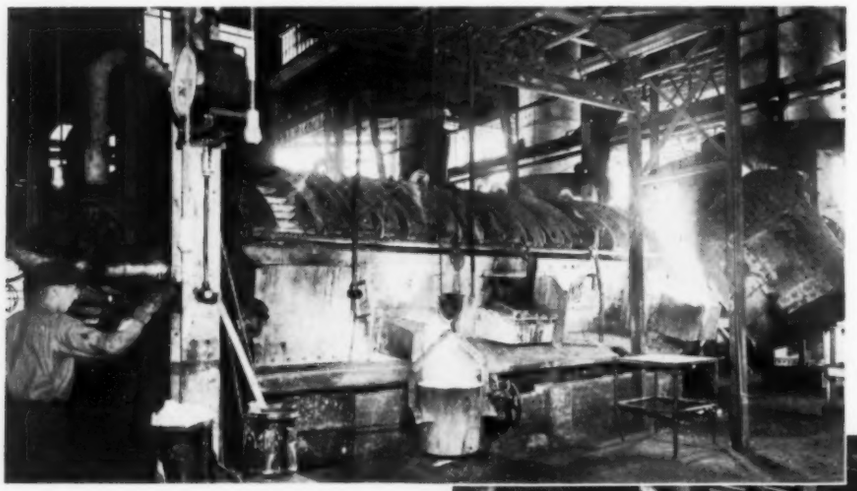
NORTON ABRASIVES

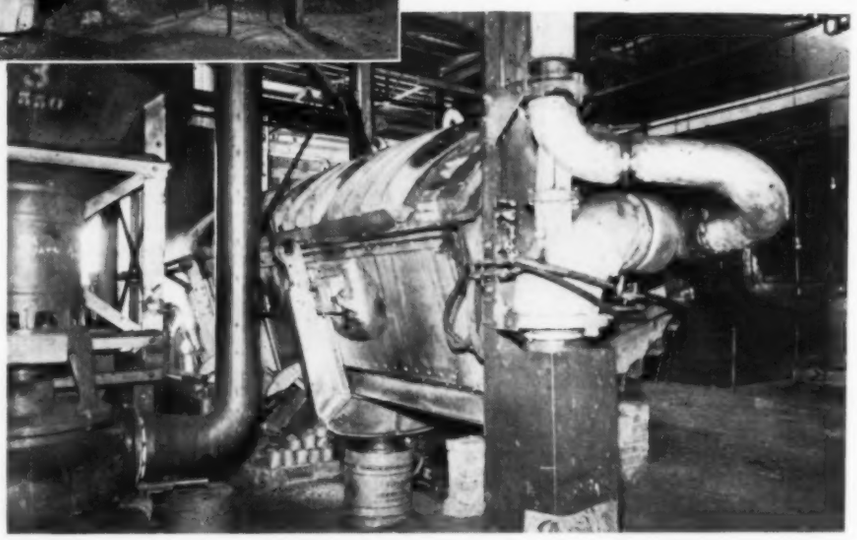
Furnace Superheats To 3000 Degrees

Whiting Corp., Harvey, Ill., recently has developed a cradle type furnace which can be used in connection with all types of melting furnaces in duplexing practice. It is a direct-fired forehearth where metal may be superheated up to 3000 degrees Fahr. if desired.

As shown in the accompanying illustration the furnace proper consists of a rectangular body or shell with removable bungs, similar to air furnace design. The body is mounted on steel tires and arranged with motor-driven mechanism to tilt 22 degrees cradle-wise in either direction.

Pouring and receiving spouts are on one side with the skimming spout on the opposite side. The furnace is designed for pulverized coal firing and uses preheated air for combustion. The pulverized coal burner enters at one end and the unit may be tilted without disconnecting the burner. Special refractory block is used for lining. The furnace is arranged for lip pouring. The unit shown here has a capacity of 10 tons and is used as a balance wheel in a continuous pouring foundry using batch type furnaces.





(Above) Furnace may be tilted 22 degrees for lip pouring. (Right) Preheated air is used for combustion in the unit

In this way an ample supply of mixed, superheated iron is available at all times for the pouring line.

Process Control

Bristol Co., Waterbury, Conn., has developed a new co-ordinated control system for operating automatically all the technical operations and factors of an industrial process. It is for processes developed and perfected in the laboratory and pilot plant, dependent upon rigid control of such factors as the time of operation of valves, pumps, etc., and the control at a definite value or time program of different variables. The co-ordinated system is an automatic machine built in the form of a master control station, consisting of recording and controlling instruments built around the so-called mechanical brain. Each system is designed and engineered for the particular process on which it is used. Instruments are standard.

Northern Illinois Group Elects

O. E. Mount, secretary and assistant treasurer, American Steel Foundries, Chicago, was the principal speaker at the regular meeting of the Northern Illinois Foundrymen's association held Nov. 10 at the Hotel Hilton, Beloit, Wis. Mr. Mount spoke on "Occupational Disease Legislation," discussing the subject from a practical standpoint.

The speaker introduced his topic by speaking briefly on legislation of a social security nature which had been passed recently. He followed this with comment on the Illinois occupational diseases act, giving a history of conditions which brought about the need for a workable plan to replace all previous legislation. Mr. Mount then discussed each section of the act, with a practical explanation of how each section operated.

Officers elected to serve during the coming year were as follows: C. V. Nass, Fairbanks, Morse & Co., Beloit, president; B. F. Richards, National Sewing Machine Co., Belvidere, Ill., vice president; P. A. Paulson, Gunite Foundries, Rockford, Ill., secretary-treasurer; and John Clausen, Greenlee Bros. & Co., Rockford, technical secretary. Directors elected for three years included H. S. Bennethum, Stover Mfg. & Engineering Co., Freeport, Ill., W. E. Goff, J. I. Case & Co., Rockford, and George Zabel, Fairbanks, Morse & Co.

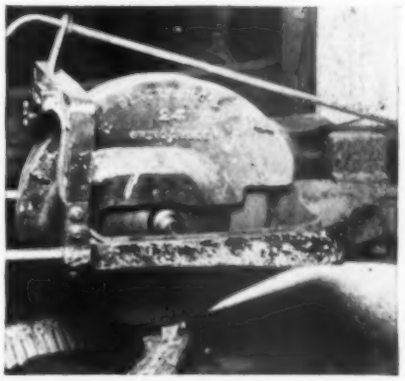
Book Review

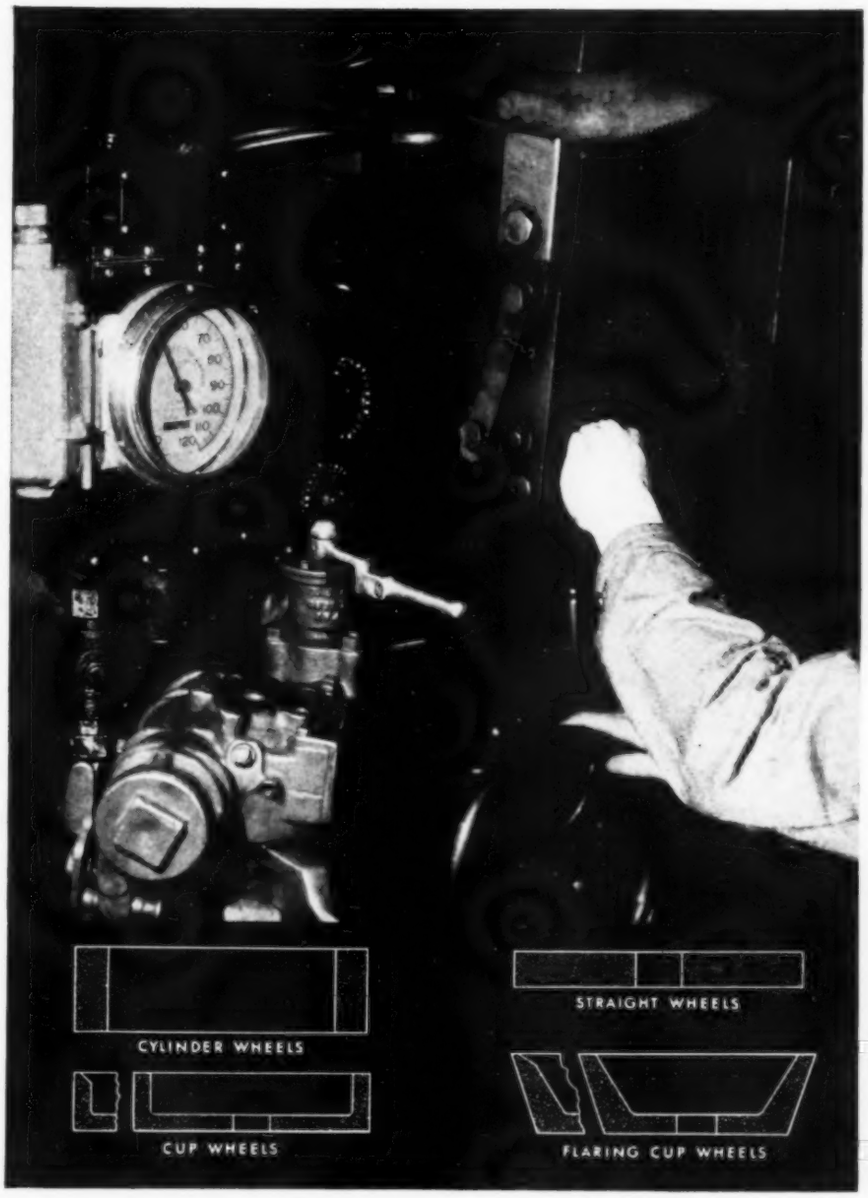
Symposium on High-Strength Constructional Metals, 125 pages, published by the American Society for Testing Materials, 260 South Broad street, Philadelphia, and supplied by THE FOUNDRY, Cleveland, for $1.50 in cloth cover and $1.25 in heavy paper and in Europe by the Penton Publishing Co. Ltd., London.

The papers and discussions appearing in this volume were presented at the seventh regional meeting of the A. S. T. M. at Pittsburgh in March, 1936. They cover chemical, physical, manufacturing and fabricating properties of metals and alloys employed for such constructional applications as buildings, ships, bridges, railway car bodies, automobile bodies, airplane wings, tanks, containers for the chemical industry, etc. The following subjects are taken into consideration: Alloys of aluminum and magnesium, alloys of copper, alloys of nickel, carbon and low-alloy steels and corrosion-resisting steels.

Open the Throttle

ON GRINDING OPERATIONS





MODERATE wheel speeds may seem "good enough" for irregular grinding schedules, but even here, stepping up the cutting rate to maximum safe standards often brings important economies. Speed grinding not only reduces costs, but also tends to produce finer finish, and frequently extends wheel life.

Through use of modern abrasive wheels bonded with Bakelite Resinoid, speed-grinding is now available for practically any type of grinding work. Snagging can be safely performed at continuous speeds up to 9,500 s.f.p.m.; cut-off, up to 16,000 s.f.p.m. As a result, many modern industries are saving one-third to one-half on grinding costs.

Basic properties of Bakelite Resinoid which provide improved speed-characteristics are: great strength to resist chipping and breakage, and high thermal stability to prevent softening or gumming. In addition, this modern bond produces porous wheel structure that rapidly dissipates grinding heat.

Leading wheel manufacturers now make Bakelite Resinoid bonded wheels for many different grinding processes. Ask your supplier about the possibilities of operating more efficiently by installing these speed wheels. Also write for our informative booklet, 15G, "High Speed Abrasive Wheels."

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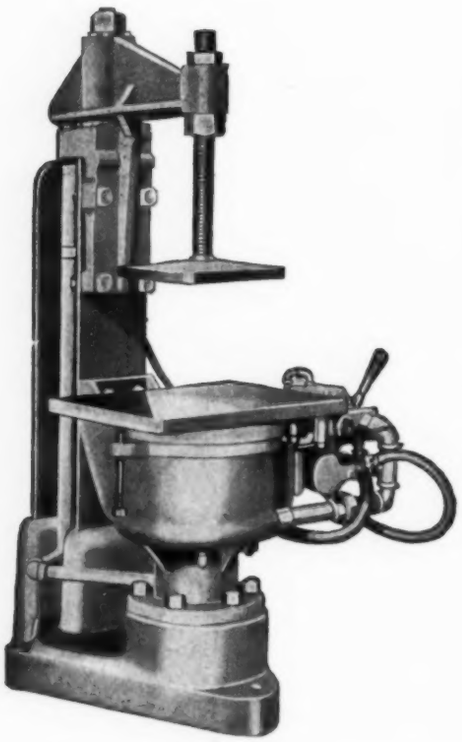


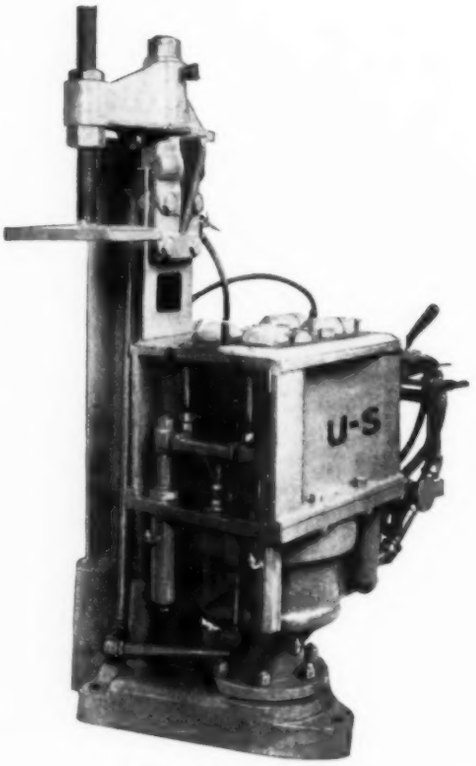
No. 1 Jolt Squeezer

The Jolt Squeezer shown at the left is built in several sizes to meet various requirements.

The machine at the right is also made in several sizes.

In both machines note the heavy rigid construction and anvil base. All working parts are fully enclosed. Both are air operated thruout with single control valve and quickly adjusted pressure head.

U-S



No. 1 Jolt Squeezer, Stripping Plate

The JOHNSTON and JENNINGS Company

ADDISON ROAD and N.Y.C. TRACKS — CLEVELAND, OHIO

N. F. A. Considers Problems

(*Concluded from page* 31)

by improper or careless use of suitable equipment. The speaker demonstrated several ways in which workers often misuse various types of respiratory protective equipment.

Through analysis of the dust content of air in foundries, Prof. Drinker has been able to show that in ordinary casting practice, the dangers from silicosis are slight. In view of these findings he suggested that it might be advisable for foundrymen to make tests in their own plants to determine actual conditions. He has found that the dust which may be found in the air of most foundries results, as a general rule, from the binding material in the sand rather than from the quartz. Few processes in the foundry industry result in a grinding action of the quartz grains.

Specimens Carefully Prepared

A paper on "A Precision High Power Metals Microscope and Its Application to the Study of Fatigue Cracks in Cast Iron", prepared by F. F. Lucas, member of the technical staff, Bell Telephone Laboratories Inc., New York, was read by Ralph M. Sample, of that organization. The discussion was well illustrated with slides. Careful preparation of specimens to be photographed at extremely high magnification should be made for otherwise imperfections in the polished surface will be of greater magnitude than the detail which is to be photographed.

Expressing the hope that foundrymen will carry the thought to business that a man off relief is a tax off industry, Walter H. Smith, representative of the National Re-Employment Service, New York, discussed phases of the program of that agency in placing men back in industry once more. He stated that in the final analysis business can provide jobs for those on relief at a lower cost than the government. He praised the heavy industries for their perfectly magnificent job in carrying employment loads during the depression.

Commissioner A. E. McClintock, in his annual report, pointed to an increasing shortage of skilled help and urged members to do their utmost in training new apprentices. A recent survey of the membership of the industry revealed that the average age of men now employed is in the neighborhood of 48 years. It is important, therefore, that young men be brought into the industry and given proper training.

Franklin R. Hoadley, vice president, Farrel-Birmingham Co., Ansonia, Conn., was elected president of the association. W. D. Hamerstadt, general manager, Rockwood Mfg. Co., Indianapolis, Ind., was named vice president; J. M. Taylor, Chicago, was re-elected secretary-treasurer and A. E. McClintock was re-elected commissioner.

New members of district committees were elected as follows: First district, George R. Holmes, McLagon Foundry Co., New Haven, Conn., Ernest F. Stockwell, Barbour-Stockwell Co., Cambridge, Mass., and Henry S. Washburn, Plainville Casting Co., Plainville, Conn.; second district, R. H. Goodwillie, Otis Elevator Co., Yonkers, N. Y.; third district, J. H. Anderson, Cooper-Bessemer Gas Engine Co., Grove City, Pa.; fourth district, I. A. Wyant, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.; sixth district, Fred H. Clausen, Van Brunt Mfg. Co., Horicon, Wis.; seventh district, G. E. Jones, U. S. Pipe & Foundry Co., Bessemer, Ala.

Past presidents, S. Wells Utley, Detroit Steel Casting Co., Detroit; Thomas S. Hammond, Whiting Corp., Harvey, Ill.; and Thomas W. Pangborn, Pangborn Corp., Hagerstown, Md., were elected honorary members of the administrative council.

Hear Gray Iron Talk In Philadelphia

Members of the Metropolitan Philadelphia Chapter of the American Foundrymen's association met at the Engineer's club Nov. 13 in Philadelphia and heard an address by H. V. Beasley on "Some Trends in Gray Iron Practice." The speaker is a member of the development and research division of the International Nickel Co., New York.

Discussion by Mr. Beasley centered around improvement in melting practice, made possible by closer control over cupola variables, the increased use of heat treatment in connection with cast iron, the wider application of the alloying principle, etc. Improved foundry methods result, most of which have been developed after painstaking foundry and metallurgical research. Increased machinable hardness and strength, improved density, grain refinement and resistance to impact, heat, wear and corrosion were a few of the improvements discussed by Mr. Beasley.

Immediately preceding the address of the principal speaker, George S. Bliss, director of the United States weather bureau of Philadelphia, delivered a short talk on improvement in weather forecasts. Dinner was served at the club with W. B. Coleman, chairman, presiding.

Alloying Requires Good Patterns

There is no fixed formula to follow in the use of alloys in foundry practice, it was stated by R. G. McElwee, Vanadium Corp. of America, Detroit, in addressing the Chicago Chapter, American Foundrymen's association at its monthly meeting, Nov. 9. C. E. Westover, Burnside Steel Foundry Co., Chicago, served as technical chairman of the session which was attended by about 100.

Discussing the general subject, "Alloys in Castings," Mr. McElwee pointed out that an adequate knowledge of melting conditions and the composition of the iron must be had before alloy additions can be recommended intelligently. In other words, the foundryman must know as much or more about the metal to which the alloys are to be added as he does about the alloys themselves, if desired properties are to be obtained in the castings.

The speaker recommended that the jobbing foundry attempt to obtain business in the particular composition of metal it is best adapted to produce. It is preferable to have a large number of customers for a few types of iron rather than to spread production over a large number of analyses, he stated.

Proper foundry practice frequently can eliminate conditions which otherwise would prove harmful, but the presence of such conditions must be recognized. For example, Mr. McElwee described a test in which clean scrap was added to part of a heat, and badly rusted scrap to the remainder. In the latter instance, the use of a deoxidizer corrected the presence of excess oxide and resulted in an iron of superior tensile strength to that containing the clean scrap.

Slides were presented of test specimens showing the effect of various graphitizing elements on the metal composition.

Prior to the technical program, two reels of pictures were shown by the Illinois Bell Telephone Co., illustrating telephone applications on airplanes and ships.

C. V. Nass, Fairbanks, Morse & Co., Beloit, Wis., spoke at a separate meeting of the nonferrous group of the Chicago chapter. He discussed melting, gating and risering of bronze and brass.

Change Methods To Cut Cost

(*Concluded from page* 33)

was set in place, rammed full of sand and removed, carrying the top half of the pattern with it as in the first instance. The dry sand slab core and green sand superstructure were lifted as in the first instance with chains and turnbuckles and placed temporarily on folded bags on the floor as shown in Fig. 6. Here the front face was finished and blacked.

A chronic shortage of oven capacity in this particular foundry intensified by an influx of loam and dry sand work was one reason for making the core as a 4-inch slab instead of the full thickness of the step in the casting. Another reason was that the slab could be dried in four hours during the day, removed from the oven and blacked on one face and along one edge while still hot. The core then was set aside over night. On the following morning it was in desirable condition for the molder's use. Two arbors were employed alternately.

Detail of assembling the mold did not differ materially from the first method. The post cores were set first, followed by the drawback or combination dry and green sand core. The cope then was lowered into position and bolted to the drag which in turn was bolted to the substantial bottom plate. Chaplet and riser arrangement were identical in both cases as shown in Figs. 3 and 7. In the second method the sprue was changed from the end to the center of one side for greater convenience.

When compared with the cost recorded on the first four castings, the remaining 30 castings showed a saving of 330 hours for the molder and helper.

Book Review

Mechanical Engineer's Handbook, eleventh revised edition, Power; leather, 125 pages, 5⅝ x 8⅝ inches; published by John Wiley & Son Inc., New York; supplied by THE FOUNDRY, Cleveland, for $5, plus 15 cents postage and in Europe by Penton Publishing Co. Ltd., London.

In this revised edition a revolutionary change has been made in the setup, the present volume dealing with the entire field of power and its applications of interest to the mechanical engineer; the other, in press, covering in detail present methods in design and shop practice.

There are 17 sections in the power volume, covering air, water, heat, combustion, fuel, steam, steam boiler, steam engine, turbine, condensing and cooling equipment, heating and air conditioning, internal combustion engines, transportation, electric power and power test codes.

The central aim is to present clearly and fully the practice approved in each division. Users of the previous editions will appreciate the changes and additions in this issue. It is edited by Robert Thurston Kent, assisted by a staff of 28 specialists.

Southerners Hear Ferrous Talk

The Birmingham District Chapter of the American Foundrymen's association held a well-attended meeting Nov. 20 at the Tutwiler hotel, Birmingham. The main speaker of the evening was Paul H. Stuff, metallurgist, Ross-Meehan Foundries, Chattanooga, Tenn., whose subject was "Modern Ferrous Castings."

In his introductory remarks, Mr. Stuff explained that he would deal with gray cast iron, malleable iron and cast steel, with emphasis on the latter, in his talk. With the use of a slide depicting the iron-carbon equilibrium diagram, he pointed out briefly the positions of these irons and gave the approximate bounding percentages of carbon in each. This was followed by micrographs showing the differences in composition and grain structure. With tables showing the strengths of various constituents of iron, Mr. Stuff pointed out the desirability of obtaining that structure which would give the maximum strength.

The speaker illustrated various types of melting units by slides and commented on their respective advantages and disadvantages. Mr. Stuff discussed different problems arising in regard to steel castings, comparing its foundry practice with that of gray iron. He closed his talk by showing slides of various castings and their installations.

Data from 1000 hardness determinations on plain and low alloy cast irons show that under equivalent conditions of structure and thickness, tests made with a 5 millimeter ball show a lower hardness than those made with a 10 millimeter ball. Also with the smaller ball there was a wider variation between individual measurements. The discrepancies between readings obtained with the two sizes of balls is attributed to the amount, size and distribution of the graphite.

Prepares Report On Alloy Cast Iron

The gray iron division of the American Foundrymen's association, through a special committee, is summarizing available information on alloy cast iron and is preparing to publish its findings as a special report of the A.F.A. The committee, under the chairmanship of H. Bornstein, Deere & Co., Moline, Ill., vice president of the A.F.A,. is composed of forty well-known foundry metallurgists and research workers.

Review work is subdivided into sections covering metallurgical theory underlying alloying, effects of the various alloying elements, properties of alloy cast irons, white and chilled alloy cast irons, heat treatment, specific applications and foundry practice. Preliminary reports of the last three mentioned were made at the 1936 convention of the A.F.A. The remaining sections were reviewed Nov. 13 in Chicago by the editorial committee, and final plans were made for publishing the complete report in the spring of 1937.

Studies Nonferrous Metal Mixtures

A regular meeting of the Connecticut Nonferrous Foundrymen's association was held Nov. 17 at the Hotel Duncan, New Haven, Conn., with President T. Joseph Judge, presiding. Speaking before a large attendance, David Tamor, metallurgist, Reading, Pratt & Cady Co., Hartford, Conn., and Harold King, metallurgist, Jenkins Bros. Co., Bridgeport, Conn., presented the technical discussion of the evening's program on "Computation of Metal Mixtures."

Methods were advanced with reference to the consumption of idle scrap in the plant. Reduction of inventories of obsolete mixtures and slow moving metals also was given consideration.

Gray Iron Founders Revise By-Laws

Directors of the Gray Iron Founder's society met Nov. 10 and created a special membership with fixed dues, for manufacturer's foundries. This move was made so that the entire industry might be represented instead of merely the jobbing foundries. Certain limitations on the powers of the directorate also were introduced to further safeguard the interests of the members. Copies of the revised by-laws may be obtained at 1010 Public Square, Cleveland.

THE NEW YEAR COMES—THE OLD YEAR GOES

Much has been accomplished in the old year, there is much to do in the new year and in the process of feeling our way along the road to normal business conditions we are thankful to the many thousands of users of STERLING WHEELS to whom a good product and good service have appealed and whose loyalty has enabled STERLING to develop new wheels, new segment units and new products designed to reduce the operating costs and improve the product of its many customers.

It is with a pledge of continued quality products and service that we enter the new year with every good wish for the success of our many friends.

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STERLING ABRASIVES

Chills On Drag Warp Castings

(*Concluded from page* 35)

will be crooked, but in cooling it will pull itself straight. The only objection to this method is that the casting always will be in a state of tension and therefore more susceptible to rupture under shock, than would a similar casting in which no internal strain is present.

In the second method shown in Fig. 2, the mold is made in two dry sand cores which are joined to form a complete unit and then turned up on edge for pouring. In this method no chills are required and as a result the casting cools uniformly and remains straight. The porosity formerly prevented by the use of chills, will be prevented in this method by four 3-inch diameter feeding risers, one at each end and two spaced equidistantly between. The top of one end riser is converted into a pouring basin by the insertion of a strainer core. To compensate for the densening effect of the former chill on the bottom, it may be necessary to change slightly the present iron mixture either by lowering the silicon or by raising the chromium content. If necessary, a small steel insert will serve more satisfactorily that an outside chill on the bosses on one side of the casting.

Risers May Be Reduced

The main objection to this second method is that the weight of the risers is approximately the same as that of the casting. However, risers are cheaper to melt than scrap castings. Possibly a few experiments might demonstrate that the number and size of the risers may be reduced to an appreciable extent. The position and sizes shown are not arbitrary. Several other combinations are possible.

Incidentally, if considered necessary, a wire with a ring in the center may be bedded in the riser opening in the bottom of the core to serve as a core print for the upper end of the small round core which appears in the center of the riser opening. This is an extra feature since the lower point will hold the core.

The steel insert chills for the bosses are grooved at the edge of the print. After the casting is cleaned the projecting part is knocked off with a hammer and the remainder stays in the casting. It is slightly smaller than the proposed hole and is drilled out during the machining operation. To prevent the metal from boiling or kicking in the vicinity, the insert is either tin or copper plated.

The Adventures Of Bill

(*Concluded from page* 86)

this method is not exactly accurate. A nearer approach to the truth would be that I stole it. A compromise between the two statements would be that I adapted something already in existence to my own use. As with nearly all prominent and wealthy people, sometimes laughingly referred to as our betters, I am a firm believer in giving away anything I cannot possibly keep.

"Now, my boy I will let you into the secret of public speaking. Collect a few anecdotes. It does not matter what they are, or where or how you find them. Practically any radio program is a fertile field for the real old veterans. Race, color, creed, nationality, or former condition of servitude, are factors of absolutely no importance. One story is used as an introduction to the speech. The others are spaced at judicious intervals and you fill in between with anything that comes into your mind. The method is infallible!"

"Thanks," said Bill. "I believe I'll give the dope a whirl."

A.F.A. Broadens Its Activities

(*Concluded from page* 39)

Mr. Avey was born in Charleston, Ill., and was educated in the public schools of Mattoon, Ill. After graduating from the University of Illinois in 1910 with a degree of bachelor of science in civil engineering, he engaged in civil engineering, editorial work and banking until 1917 when he became connected with the Penton Publishing Co. as associate editor of *Iron Trade Review*, now Steel. Later he joined the editorial staff of THE FOUNDRY and in 1919 was made managing editor of this publication. In 1926 he was made editor of THE FOUNDRY.

In his new position as secretary-treasurer of the American Foundrymen's association, Mr. Avey's extensive experience in the foundry field will continue to be at the disposal of the foundry industry.

Productive Equipment Corp., Chicago, has established a research department for screening problems. This laboratory performs a new service and will be conducted along educational lines toward the development of better screening.

Two A.F.A. Exchange Authors Selected

The American Foundrymen's association has selected O. W. Ellis and W. Paul Eddy Jr. as exchange authors for the 1937 meetings of the British and French foundry associations respectively.

This exchange of papers among the leading foundry technical associations of the world was instituted in 1920, the first paper being presented by the late George K. Elliott on behalf of the A.F.A. before a meeting of the British institute. An international foundry committee was organized later to control this exchange arrangement and to schedule, periodically, international foundry congresses.

Plan Joint Meeting At Birmingham

The fifth joint foundry practice meeting of the American Society of Mechanical Engineers and the American Foundrymen's association, will be held Feb. 25, 26 and 27 at the Tutwiler hotel, Birmingham, Ala. Chairmen of the various committees have been selected as follows: General chairmen, George R. Ozley and J. T. MacKenzie; program chairman, R. R. Deas Jr.; registration chairman, J. E. Getzen; publicity chairman, Russell Hunt; attendance chairman, Harry Mouat; entertainment chairman, J. B. Hayes; and chairman of the plant visitation and transportation committee, J. A. Woody.

The 1937 meeting will feature safety, hygiene and equipment for foundries.

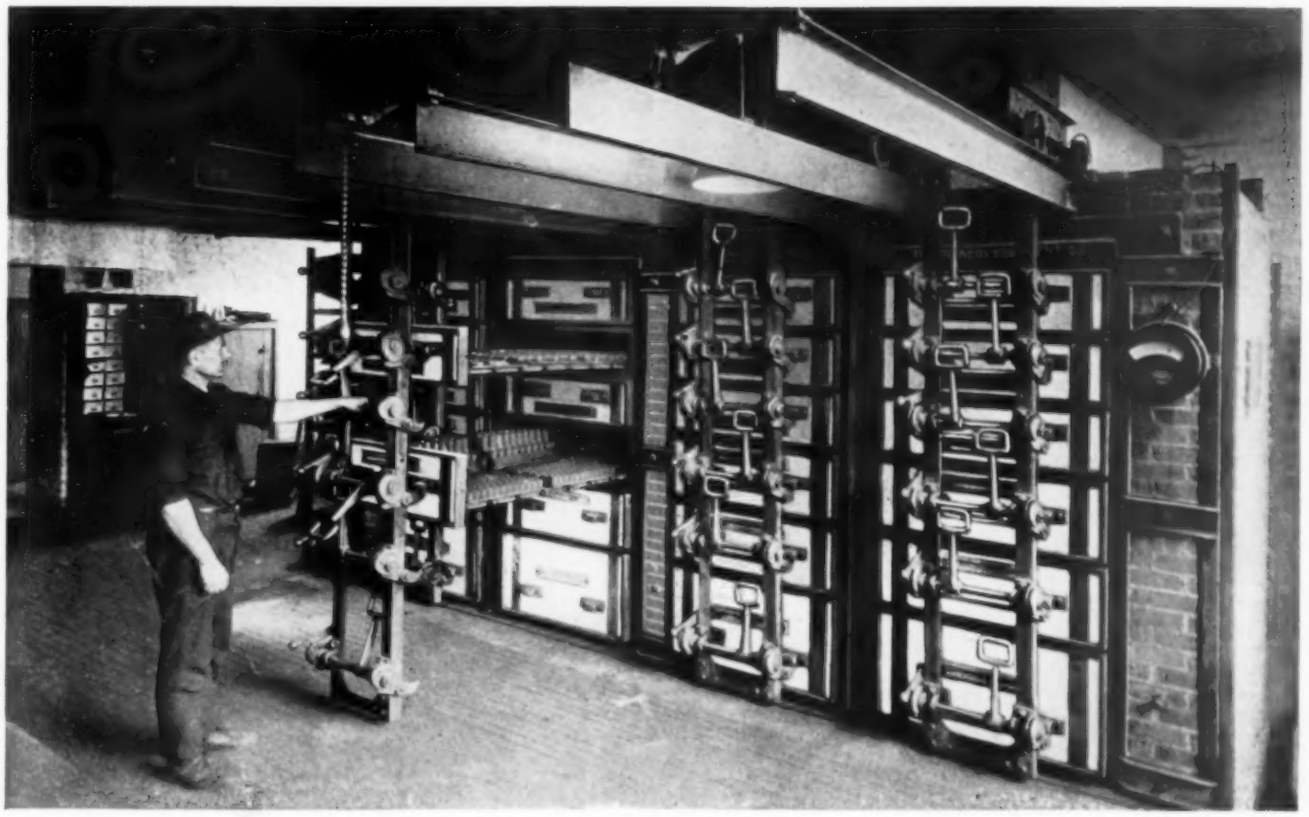
A.F.A. Plans Program For Milwaukee

(*Concluded from page* 34)

Nickel Co. Papers for the other sessions of that division will be on "High Tensile Brasses," "Casting 30 Per Cent Cupro-Nickel," and "X-ray as a Control Test."

A general interest session will be sponsored by the A. F. A. committee on foundry sand research, at which time, in addition to the committee's report, papers will be presented dealing with "Research Work on Durability of Foundry Sands," and "Core Hardness." The sand control shop operation course will consist of three sessions for the purpose of providing instruction for the shop men in the fundamentals of methods of carrying on sand control in the smaller sized foundry. Further details will be announced later.

Coleman Rolling Drawer Core Ovens



Four COLEMAN Rolling Drawer Core Ovens fired by single oil burner.

THESE ovens are practically continuous core-baking machines. One or more drawers can be loaded or unloaded while the cores in the remaining drawers are being baked. Automatic closing plates prevent the escape of heat and gases.

Particularly suited for small and medium work, and will turn out more work for floor space occupied and fuel consumed than can be obtained by any other type of oven construction.

Patented double-suspension ball-bearing drawer pullers provide easy, vibrationless operation of even the most heavily loaded drawers.

Drawers run inside the oven on differential frictionless, self-aligning rollers which require absolutely no lubrication, regardless of oven temperatures.

Coleman Ovens are a product of thirty years' specialization in core baking and mold drying. Over 4000 COLEMAN OVENS in successful operation in leading foundries everywhere.

BUILT IN ALL TYPES AND SIZES—
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FOR OPERATION WITH ANY FUEL—
Gas, Oil, Coke, Stoker-coal, Powdered-coal, etc. Direct-fired and external recirculating heating systems.

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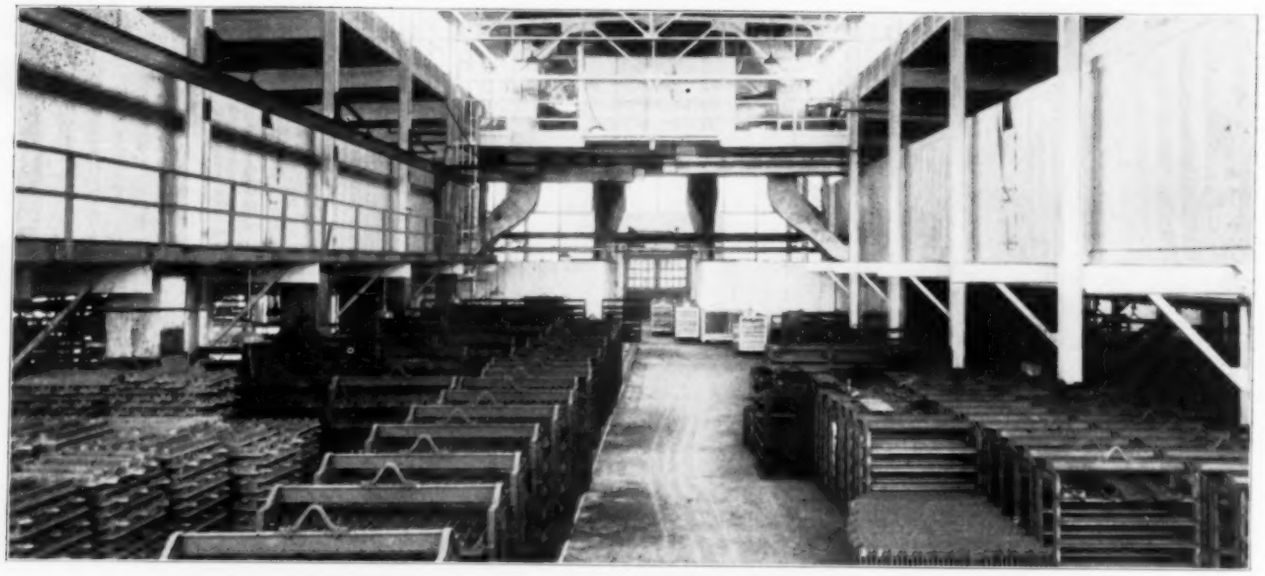
BUILDERS OF COLEMAN AND SWARTWOUT OVENS
CONTRACTING ENGINEERS AND MANUFACTURERS

C L E V E L A N D • O H I O

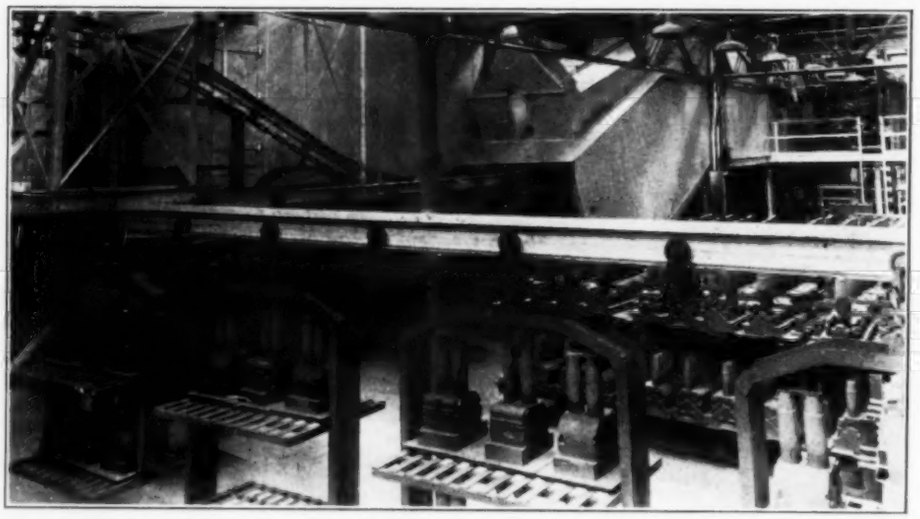
TYPICALLY OUTSTANDING MODERN CORE OVEN INSTALLATIONS COMPLETED IN 1936

(By Carl - Mayer)



OVENS

Core and Mold
Paste Drying
Blacking
Shelf
Rack
Car
Monorail
Horizontal
Vertical

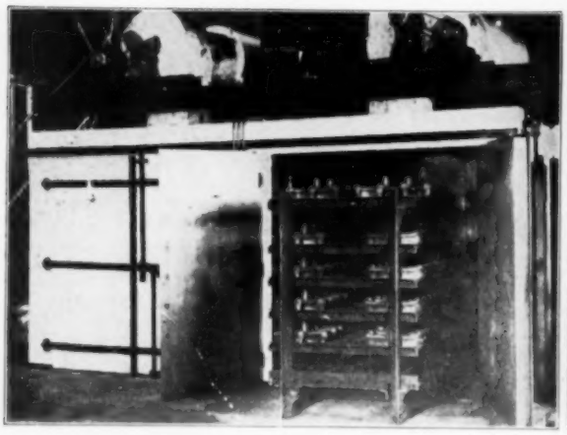


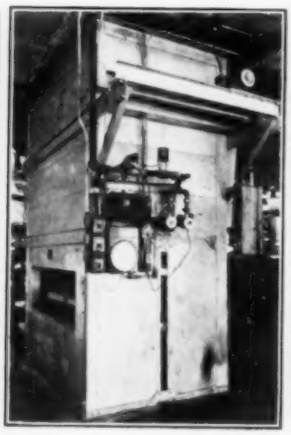
Heated With

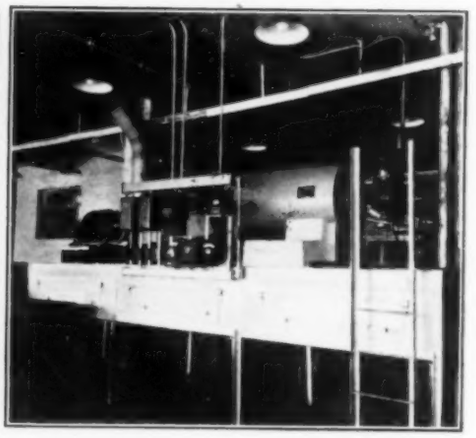
Gas, Oil
Coke or Coal
Butane
Propane
Electric Heat
Steam

By Means Of

Air Heaters and Conventional Methods







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Obituary

MATTHEW FRANK GARTLAND, 79, chairman of the board of directors, Atlas Foundry Co., Marion, Ind., died Nov. 11 in Marion. Born in Naugatuck, Conn., he went to Marion 47 years ago and started the Marion Gray Iron Foundry in partnership with J. H. Schaumleffel and John C. Haswell. They also organized the Atlas Foundry Co. and in 1918 the two firms were merged. Mr. Gartland was secretary-treasurer until the merger, when he became chairman of the board. He was also chairman of the boards of the Gartland-Toledo Foundry Co., Toledo, O., and the G. & C. McCarthy Foundry Co., Chicago. In addition he was a director of the Dayton Malleable Iron Co., Dayton, O.

• • •

Andrew A. MacLean, 55, president of Fisher Brass Inc., Marysville, O., died in Marysville, Nov. 1.

• • •

W. L. Perkins, 76, manager of the Cincinnati plant of the United States Pipe & Foundry Co. until his retirement in 1926, died in Cincinnati recently.

• • •

Carl Leis, 45, chief engineer and factory manager of the Johnson Bronze Co., New Castle, Pa., died in New Castle recently. He was a past president of the Mahoning-Shenango Engineer's society.

• • •

Othmar I. Larsen, 53, assistant to the president, Borg-Warner Corp., Chicago, and formerly president, Marvel-Schebler carbureter division of Borg-Warner Corp., died in Highland Park, Ill., Nov. 23.

• • •

Walter Flannery, 45, at one time representative in the Detroit district for Vanadium Corp. of America and member of the Pittsburgh family which developed the company, died in New York Nov. 23.

• • •

Frank Maujean, for a number of years connected with the Monarch Engineering & Mfg. Co., Curtis Bay, Baltimore, and well-known in the foundry field, died Nov. 24 at his home in Newport, Ky.

• • •

Charles A. Patterson, 62, for many years a Cleveland foundry executive and late president of the Standard Sand Co., Cleveland, died in Cleveland Nov. 13. He was associated formerly with the Atlantic Foundry Co. and was vice president of the former Fulton Foundry Co. His father, one of Cleveland's earliest foundrymen, started the Patterson Foundry Co. He was also one of the organizers of the Ajax Mfg. Co. Born in Cleveland in 1874, Mr. Patterson received his education in schools in that city, graduating from Case School of Applied Science.

• • •

W. N. Rumely, 78, formerly head of M. Rumely Co., La Porte, Ind., and other machinery manufacturing enterprises in Sycamore, Ill., Hamilton, O., and Chicago, died at his home in Chicago, Nov. 24.

• • •

Levin Faust, 73, prominent industrialist of Rockford, Ill., died in that city Nov. 18. Mr. Faust was one of the founders of the various large industries of Rockford and was actively identified with most of these companies as an officer or director at the time of his death. He was one of the founders of the Mechanics Universal Joint Co., the Rockford Drop Forge Co., Forgings & Stampings Inc., Rockford Machine Tool Co., National Lock Co., Sundstrand Adding Machine Co., Sundstrand Machine Tool Co., and the Sundstrand Engineering Co. Recently he was president of the Elco Tool & Screw Co., vice president of the Rockford Drop Forge Co., treasurer of Forgings & Stampings Inc., and vice president of Sundstrand Machine Tool Co.

Book Review

Oil Heating Handbook, by Hans A. Junitz, fabricoid, 456 pages, published by J. P. Lippincott Co., Philadelphia, and supplied by THE FOUNDRY, Cleveland, for $3.50 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., London.

This handbook deals mainly with the principles, installation and maintenance of oil burners, particularly with reference to domestic use. The book is divided into four main divisions dealing with fuels and combustion; heating, including operative controls; installation and operation of oil burners; and retail sales. The last part deals with forms, tables and terminology.

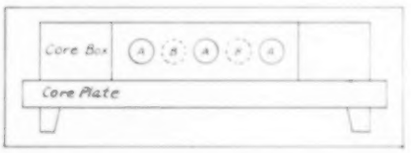
The national oil burner and air conditioning exposition and convention will be held March 15 to 19 at Convention hall of the Commercial museum, Philadelphia.

Leeds & Northrup Co., Philadelphia, has opened a new branch office at 75 Pearl street, Hartford, Conn.

Core Fuses Inside Heavy Casting

We are forwarding a drawing of a heavy casting from which we have trouble in removing two long narrow cores 33 inches in length 1¼ x 3¼ inches at one end and 1¼ x 3 15/16 inches at the other end. The cores apparently are saturated with iron, but the hole is clean when the core eventually is removed. These cores have been made from the best bank sand, also from silica sand bonded with oil 1 to 45. The vent comes freely for 15 minutes from a ¼-inch vent. The vent then becomes filled with metal, or a substance which resembles metal in some particulars. We also have similar trouble with a small core shown elsewhere on the same drawing.

Without entering into a discussion of the chemical composition of



Proper venting and rodding will provide a satisfactory core

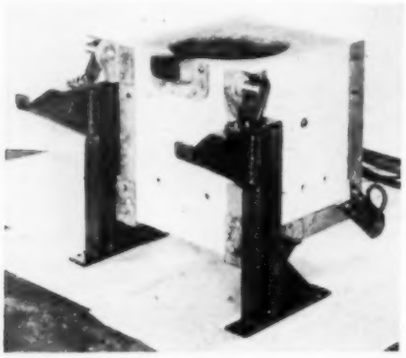
the material forwarded for observation, it is sufficient to say that it is not iron but represents the combined effect of heat and compression on the body of sand. The remedy in the present instance is to provide a core that will hold its shape while the metal solidifies in the vicinity, and then will yield under the compression of the contracting metal. This may be accomplished by placing three ½-inch vent holes in the core as shown at *AAA* in the accompanying illustration. Two ½-inch rods *BB* will supply all the necessary reinforcement.

Presumably the core is made as shown in a plain open frame laid on a plate. The top is scraped off flush with a short strickle and the vent rods are pulled out through holes in the end of the box. The core should be made from a good grade of silica sand bonded with oil, or in fact with any of the modern binders. Bank sand, that is sand with a certain amount of clay or natural binder should not be used. The clay fuses at a lower temperature than the sand and then becomes vitrified. As an added precaution, it might be advisable to fill the interior of the core with a certain amount of the sand mixture containing about a handful of fine sawdust or wood flour. This will burn freely through the large vents and will not cause any disturbance. Coat the cores with silica wash. The small core may be treated in a somewhat similar manner.

NEW EQUIPMENT . . . . for foundries

Builds Sixty Pound Tilting Furnace

Ajax Electrothermic Corp., division of the Ajax Metal Co., Trenton, N. J., recently has developed a 60 pound tilting furnace for use with a 20 kilowatt converter. Shown in the accompanying illustration, the unit is for use with nonferrous and precious metals only. Where more than 30 pound charges of brass or copper are required, the tilting furnace is said to be satisfactory not only in research laboratories but also in the commercial melting of silver and gold.



Unit is for use with nonferrous and precious metals

This built-in crucible type furnace is claimed to offer the advantage of better heat insulation because no air space or hard layer of refractory is necessary just outside the crucible. Crucibles in the furnace can be changed in approximately one half hour. The furnace will melt 60 pounds of brass in about 40 minutes with a hot start and 70 minutes with a cold start.

In the converter equipment, the circuit is oscillatory with a frequency of about 25,000 cycles. Use of hydrogen facilitates the passage of the arc and allows the oscillating current to pass through the gap more freely.

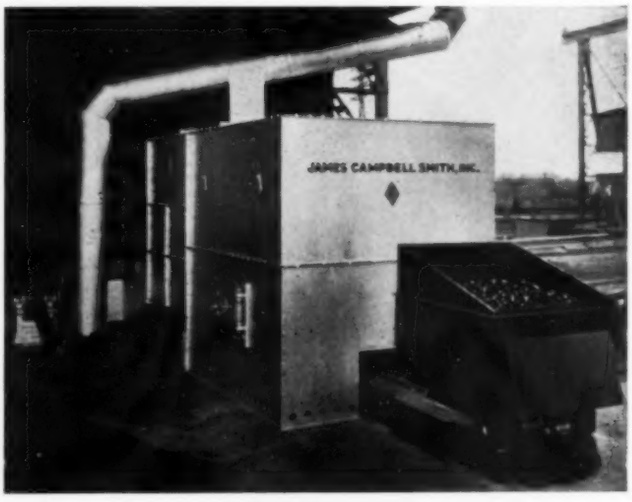
Pivoted Motor Bases

Rockwood Mfg. Co., Indianapolis, has placed on the market a pivoted motor base said to maintain constant tension in the belts. V-belt stretch and slip are claimed to be eliminated by use of these bases. Tension is removed from the belts when the drive is not running. Bases can be purchased either separately or complete with V-belt drive. In an installation of a base on an existing drive, the motor is raised, the base slid into place, bolted to the floor and the motor attached to the base.

Industrial Heater Is Coal-Fired

James Campbell Smith Inc., Cleveland, has developed a new, automatic indirect coal-fired industrial air heater for use in connection with ovens or for space heating. The heater, shown in the accompanying illustration, is adapted also to summer air conditioning, since it can be used to warm, filter, humidify, de-humidify and refrigerate.

The heater consists essentially of a combustion chamber to which coal is fed automatically by a controlled stoker. The heat exchanger is similar to the oil and gas-fired types employed by automobile companies in paint-drying ovens. One motor, controlled by a thermostat, drives both the fan for supplying air for combustion and also the worm feed. A bypass damper in the roof of the chamber above the interchanger tubes automatically opens and passes damaging gases up the stack. Heat interchanger is built of heavy rectangular steel tubes. Air to be heated flows counter to the gases and the hottest gases hit the hottest air tubes first, the cooler gases hitting the coldest air tubes. Ample provision is made for cleaning the unit.



One motor drives both the fan and the worm feed

Use Dome Reflector On Mercury Lamp

Westinghouse Electric & Mfg. Co., Pittsburgh, has designed a new dome type, low mounting reflector for use with the 400 watt high intensity mercury lamp. Equipped with a monax glass cylinder which surrounds the lower portion of the lamp providing a 72½ degree angle of cutoff, it is designed for mounting heights of 10 to 18 feet. Shown in the accompanying illustration, the reflector is porcelain enameled.

Reflector is designed for mounting heights of 10 to 18 feet

A collar of monax homogeneous glass is supported by three steel

Luxit
(TRADE MARK, REGISTERED)

The MONOLITHIC (One Piece) LINING

for **LADLES**
for **CUPOLAS**
for **BRICKSETTING**

ASK any of our regular customers about LUXIT. Chances are he can tell you a story much like the following. This is a "true story" by the way.

"Daily heat 130 tons. Ladles formerly lined with clay and fire-sand mixture two inches thick and lined daily. Now lined with "LUXIT" ¾ inch thick and run six to ten weeks without relining. This firm required 13 men pushing ladles around the shop. Now only 11 men are required due to the fact that the "LUXIT" lined ladles hold more iron and as the thermal conductivity is so much lower the iron is more fluid and holds the heat longer."

LIQUITOL: *Three Grades*

for Gray Iron Castings
for Steel Castings
for Special Steel Castings

A scientifically prepared dry powder which insures sound castings. Eliminates piping in castings. Heads reduced 40%. Eliminates cavities and porosity and greatly reduces scrap heads and runners.

"SPEEDY" MOISTURE TESTER:

Enables you to ascertain moisture content of sand in a few moments. If the moisture content of your sand is required, you cannot do without this simple instrument to ascertain moisture at the sand pile. Ask for further particulars.

References from constant users of all our products gladly submitted. Write for literature.

THE ALPHA-LUX COMPANY, INC.

192 Front St., New York City

PLANTS: Philadelphia, Pa. — Chicago, Ill. — Cicero, Ill.

(*Concluded from page* 90)

cadmium plated supports locked securely in the top portion of the reflector. A skeleton socket with high heat wax and nickel plated interior is mounted rigidly in the hood to position the lamp in the reflector properly.

Dust Counter Gives Twelve Samples

A dust counter enabling accurate dust counts without extensive laboratory training or experience by the operator has been developed by the Bausch & Lomb Optical Co., Rochester, N. Y. This instrument, also distributed by the Willson Products Inc., Reading, Pa., combines in one unit the necessary air sampling device and dark field microscope viewing and counting system, mounted on a circular base, provided with illuminating apparatus and suitably cased.

A hand pump draws air through the moistening chamber of the instrument

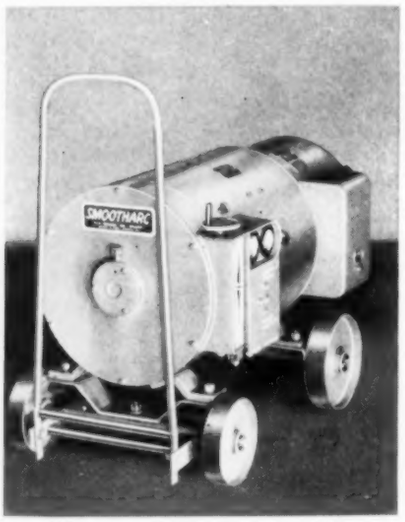
As illustrated, the instrument draws air through a moistening chamber by a calibrated hand pump of 1/1000 cubic foot capacity. Dust particles suspended in the air are impinged on a circular glass plate within the instrument, in the form of a ribbon. Twelve samples may be collected on one slide. Apparatus consists of a built-in compound microscope magnified 200 times with a special dark field illuminating system. The hyperplane eyepiece contains a micrometer disk ruled in 30 micron squares. By multiplying the number of dust particles in the square fields by 100,000 the total dust count per cubic foot is secured.

Measures, Records Fuel Consumed

S. F. Bowser & Co. Inc., Fort Wayne, Ind., has devised a system which measures, indicates and records the quantity of oil or tar being consumed in industrial furnaces and the rate at which it is being delivered to the furnace. Fuel, on being pumped into the registering meter, causes the displacement rotor in the meter to revolve. The extended end of the shaft to which this rotor is fixed is connected directly with the tachometer generator which generates the low voltage electrical force. This force actuates the wall indicator dial, showing the rate at which the fuel is being fed into the furnace. Shipping weight of the standard system, including meter, indicator, and indicator-recorder, is 135 pounds.

Welders Have Single Current Control

A new line of welding machines built in both vertical and horizontal types for stationary and portable mounting has been developed by the Harnischfeger Corp., Milwaukee. Vertical units are produced in three sizes, 75, 100 and 150 amperes, and the horizontal in 200, 300, 400 and 600 ampere capacities. As shown in the accompanying illustration, alternating current motor starting box in the welders is built into the side of the motor housing.

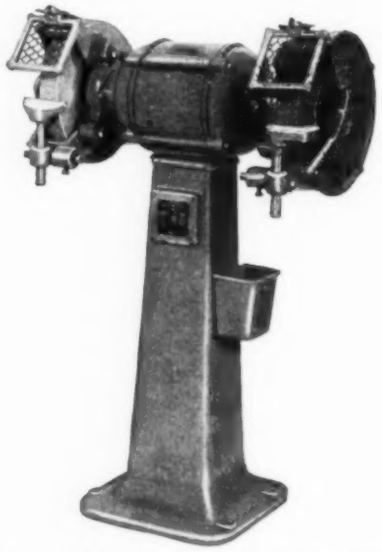


Control is made possible by the design of shifting generator brushes

All sizes are provided with single current control made possible by the design of shifting generator brushes. Through the medium of a micrometer screw device the brush shifting gives an infinite number of current settings. Voltage regulation is automatic. Self-excitation is accomplished through a set of auxiliary brushes placed ahead of the main brushes and connected to an auxiliary shunt winding. These operate in an independent magnetic field. Auxiliary brushes attached to the main brush ring are shifted simultaneously with the main brushes.

Grinder Has Push Button Control

The two horsepower grinder, shown in the accompanying illustration, is a development of the James Clark Jr. Electric Co., Louisville, Ky., for continuous duty at 1750 revolutions per minute. Equipped with push button control with overload protection, enclosed safety guards, adjustable for wheel wear, the unit has nonshatterable glass eye shields. A tool rest, adjustable both horizontally and vertically, water pot, two 2 x 12 inch face and a 1-inch hole grinding wheel and an optional exhaust opening in the bottom of the wheel guards are other features.

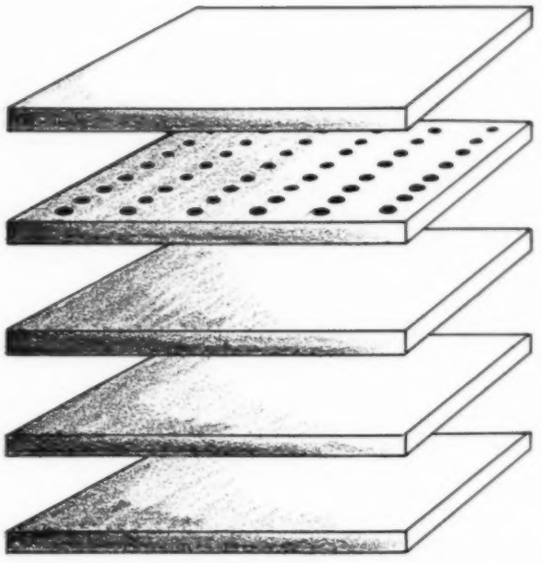


Rotor shaft is mounted in heavy duty ball bearings

The motor of the grinder is totally enclosed and the rotor shaft is mounted in heavy duty precision type ball bearings, grease lubricated against grit and dirt. The motor will stand a momentary overload of 100 per cent. Total shipping weight of the unit is 535 pounds, its net weight being 445 pounds.

Russell-Hale Co., 2812 Center street, Houston, Tex., is operating a foundry supply business and acting as manufacturers representatives in the Texas district.

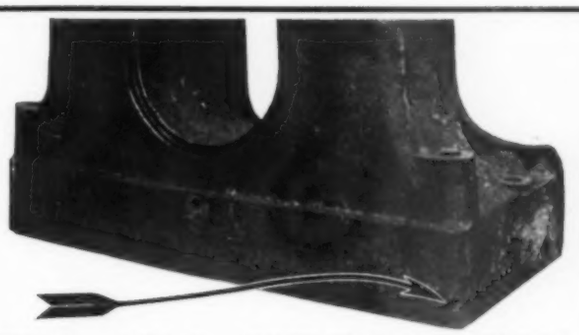
CORE PLATES
CORE PLATES
CORE PLATES



Remember—it's not the initial cost of Moltrup Core Plates—but the lasting economy they bring to your shop—that counts! Drop us a line—we'll be glad of the opportunity to send you more complete information.

MOLTRUP STEEL PRODUCTS CO.
BEAVER FALLS, PA. (Pittsburgh District)
Sales Offices in All Principal Cities

MOLTRUP
MOLTRUP
MOLTRUP



FILL THE SURFACE PITS with SMOOTH-ON No. 4

SCRAPPING this sound casting because of a few harmless sand holes or other surface depressions would be the height of folly, but—for best sales value, the surface should be filled to true contour.

Smooth-On No. 4 gives universal satisfaction in this service because it is quickly applied, hardens into metallic iron, can be filed or machined like iron, and costs so little that the saving of a single large casting easily pays for a whole year's supply.

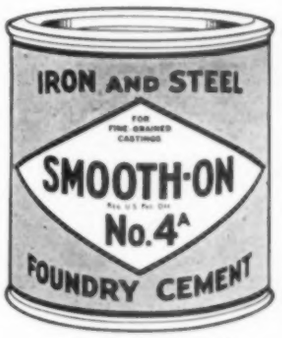
Three compositions, each with distinct color, degree of lustre and fineness of grain offer a choice for perfect match in iron and steel castings of any shade, appearance and quality.

Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish

Smooth-On No. 4A. For medium gray castings. A fine-grained cement that has a good metallic lustre

Smooth-On No. 4B. For dark gray castings. A cement of coarser grain and darker shade

Castings judiciously treated with Smooth-On No. 4 pass any inspection, and sell for the highest price. Make a critical test, and you will find your filling problems well solved.



FREE
HARDENED and WORKING
SAMPLES

Smooth-On Nos. 4AA, 4A and 4B packed in 1-lb. and 5-lb. can, 25-lb. pail or 100-lb. keg. Mail coupon for prices and free hardened and working samples.

Smooth-On Mfg. Co., Dept. 17,
570 Communipaw Ave., Jersey City, N. J.

Please send samples of ☐ Smooth-On No. 4AA ☐ Smooth-On No. 4A ☐ Smooth-On No. 4B

Name.....

Address.....

.....

12-36

***Do it with* SMOOTH-ON**

PANGBORN-NORBIDE★
"LONG-WEAR" BLAST CLEANING NOZZLES

The diamond-like hardness of Boron Carbide, with which these nozzles are lined, is the secret of their long life. This is the hardest material ever made by man for commercial use.

Users of blast-cleaning equipment who are interested in the economy and efficiency effected by these nozzles are invited to write us. There is a size and type to meet your requirements.

★ Trade-mark of Norton Co. for Boron Carbide

GUARANTEE: 1500 hours service with steel abrasives—750 hours with sand.

PANGBORN CORPORATION

The World's Largest Manufacturer of Blast Cleaning and Dust Collecting Equipment

HAGERSTOWN - - - - MARYLAND

GATES AND RISERS FOR CASTINGS

By Pat Dwyer

373 pages, 6 x 9 — 244 drawings, show all features — Indexed for ready reference

For the

Manager
Superintendent
Foreman
Molder
Patternmaker
Apprentice

GATES AND RISERS FOR CASTINGS, by Pat Dwyer, engineering editor of The Foundry, covers completely and with authority a subject never before presented in book form. It is a complete encyclopedia, a ready reference and a practical everyday guide to sound foundry practice. The material which appeared in The Foundry, serially, over a period of four years has been compiled in permanent form for practical shop service. It is simply written and completely illustrated to be easily understood, even by beginners. It covers many of the answers to the ever pressing question, "How can defects be prevented?"

Improved knowledge of gating reduces scrap, improves quality and appearance of castings. Ambitious foundrymen will find this book valuable in improving their knowledge. Progressive owners can profit by placing this work in the hands of superintendents, foremen and ambitious workmen.

Five sections comprising 27 chapters with 373 pages, cover all varieties of gray iron, brass, bronze, aluminum, steel and malleable practice.

To make this available for training and educational requirements, an extremely low price of $3, plus 15 cents for postage has been established.

The Penton Publishing Co.
Book Dept.
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Date .....

Enclosed is $3.15 for which please send, all charges prepaid, one copy of "Gates and Risers for Castings", by Pat Dwyer.

Name ..... Company .....

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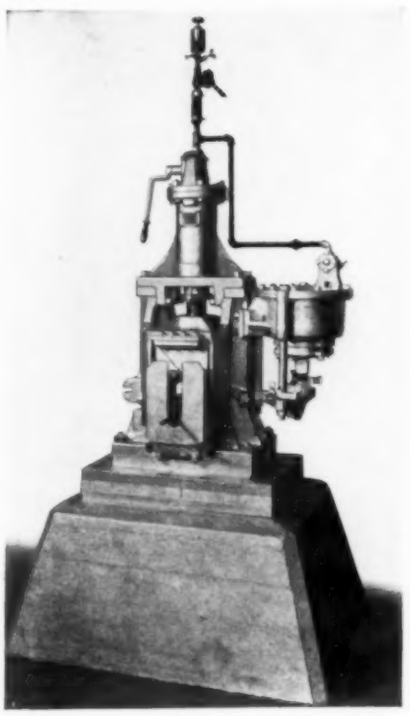
Designs Rod Machine Of Cast Steel

American Foundry Equipment Co., Mishawaka, Ind., has developed a rod straightener and shear machine. Shown in the accompanying illustration, it is made in sizes from a small hand operated model with a maximum straightening capacity of ¼-inch rods to a large com-



Straightening mechanism is composed of manganese steel dies

pressed air, sixty pounds being the minimum pressure for satisfactory operations. Straightening mechanism is composed of manganese steel dies which close as a contracting square on the rod or bar and deliver an impact on all four sides simultaneously. The machine is constructed of cast steel with the exception of cylinder parts which are cast iron.

Corrosion Resistant Specialties Made

Two new products, designed to meet corrosive problems in a variety of plants where acid, alkali and other corrosive agents are encountered, have been placed on the market by the International Nickel Co., New York. The first is a caster for trucks, hampers and wheeled conveyors of all kinds. Constructed of monel metal, it is available in stationary and swivel roller types. Wheels are rubber composition. Casters are manufactured by the Bassick Co., Bridgeport, Conn. The second piece of equipment is a graduated type monel pail, available in standard sizes of 12, 14 and 16 quarts. Bottom and sides are electrically seam welded. Monel ears are spot welded to the sides. No rivets are used.

Metallographic Unit Used for Research

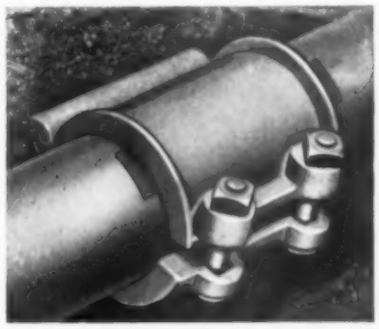
Bausch & Lomb Optical Co., Rochester, N. Y., has developed a new research metallographic outfit shown in the accompanying illustration, with equipment for work with bright and dark field polarized light. Magnifying range is from a low limit of 2.5 times to the highest magnification possible with oil immersion objective and high power eyepieces.

Equipment consists of inverted microscope units, illuminating system with either motor driven or tungsten arc lamp, an 8 x 10 camera with a graduated bar support to give bellows reading directly, a supporting bed, an accessory cabinet and an adjustable cushioned stool. Circular stage of the instrument is of the revolving type, six inches in diameter. Vertical illuminator serves not only for bright field work but as an analyzer and polarizer for polarized light work. The dark field illuminator is a glass cube with central stop mounted in a rotating turret with the vertical illuminator prism. A higher intensity photomicrographic lamp is provided.

The next congress of the International Association for Testing Materials will be held in London, England, from April 19 to 24, 1937.

Pipe Clamps Tested Under Pressure

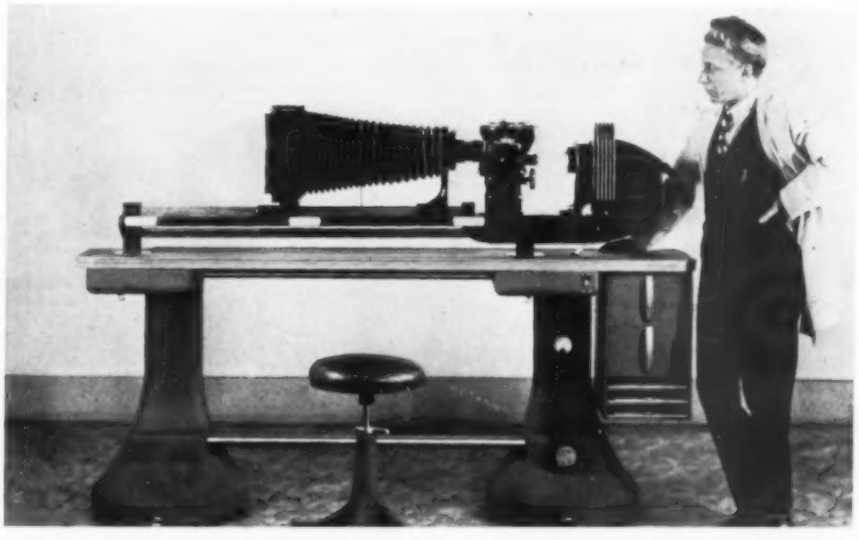
Pipe clamps for permanent stoppage of leaks in pipes of all sizes and pressures have been redesigned by the M. B. Skinner Co., South Bend, Ind. Intended for use on all types of carriers, these clamps, shown in the accompanying illustration, may be installed while the pipe is in service except on certain high pressure applications. Clamps



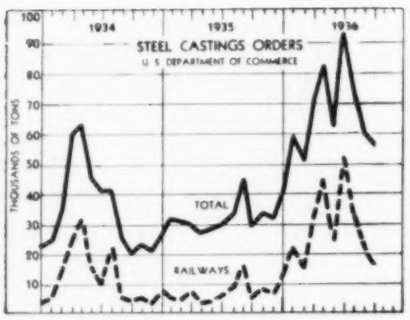
Clamps are tested under a pressure of 3000 pounds

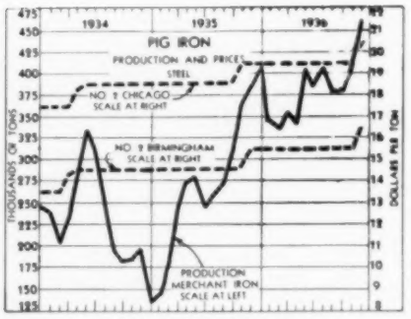
are tested under a pressure of 3000 pounds at the factory. Of malleable iron construction, the devices are hinged on one side for easy installation. Two cadmium plated steel bolts hold it in position. Products are enameled and supplied with a rubber gasket, in sizes ranging from ½ to 12 inches.

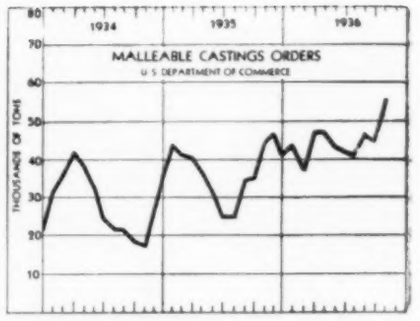
Rotor Air Tool Co., has moved its plant and office to 17325 Euclid avenue, Cleveland. The new location will provide additional space and improved facilities needed in the manufacture of all tools and high frequency electric tools.



Circular stage of the instrument is of the revolving type, six inches in diameter







Foundry Activities

DIXIE FOUNDRY CO., Cleveland, Tenn., has approved plans for a $100,000 building expansion and modernization program. New molding floors and a two-story cleaning and mounting department will be part of the plans. S. B. Rymer is president of the company.

* * *

Egyptian Iron Works, Murphysboro, Ill., recently suffered severe fire damage.

* * *

Queens Bronze & Aluminum Foundry Inc., New York, has been organized by Russell R. Kittel, 6 East Forty-fifth street, New York.

* * *

Forest City Foundries Co., Cleveland, made a new addition to its molding department at the Walworth Run division recently.

* * *

Keen Foundry Co., Griffith, Ind., is building an addition to its foundry and a new power house at a cost of approximately $15,000.

* * *

Glens Falls Foundries Inc., Glens Falls, N. Y., has been incorporated to make machinery, tools and valves.

* * *

Connecticut Malleable Castings Co., New Haven, Conn., is constructing a one story steel and brick foundry addition.

* * *

Poole Foundry & Machine Co., Woodberry, Baltimore, will construct a foundry and shop building. Carlstrand Engineering Co. is contractor.

* * *

Dominion Foundries & Steel Co. Ltd., Hamilton, Ont., is planning expansion of its plant facilities on Depew street.

* * *

United States Foundry Corp., Kalamazoo, Mich., has been formed by Edwin Doerschler, 1205 Staple avenue, Kalamazoo, to manufacture castings.

* * *

Crown Iron Works Co., Minneapolis, has started construction on a second-story addition to its factory building, 21 x 74 feet. E. L. Anderson is president.

* * *

United States Pipe & Foundry Co., Chattanooga, Tenn., has completed alterations to its plant buildings and will install machinery in January.

* * *

American Steel Foundries, Chicago, is preparing to reopen its plant at Verona, Pa., in the Pittsburgh district, which has been idle for about 6 years. Resumption of operations is scheduled for Jan.. 1.

* * *

Ebaloy Foundries Inc., Rockford, Ill., has been incorporated by F. L. Mitchell and associates to engage in a general foundry business. Frank A. Welsh, Rockford, is correspondent.

* * *

Elmira Foundry Co., Elmira, N. Y., will install gas equipment to heat its ovens and buildings, as part of an expansion program which includes storage building, crane runway and crane and other equipment. Foundation work is being done by Henry W. Streeter Corp.

* * *

Dow Chemical Co., Midland, Mich., will remodel its recently acquired plant, former site of the Union Motor Truck Co., on Patterson avenue, Bay City, Mich., at a cost of $20,000. The plant will be occupied by the entire Dowmetal foundry unit of the company.

* * *

Construction of an addition to the foundry of the Wisconsin-Appleton Co., Milwaukee, has been started. The addition will be 80 x 180 feet and will cost $30,000. E. B. Hansen is secretary of the company. General contract was awarded to the Austin Co., Cleveland.

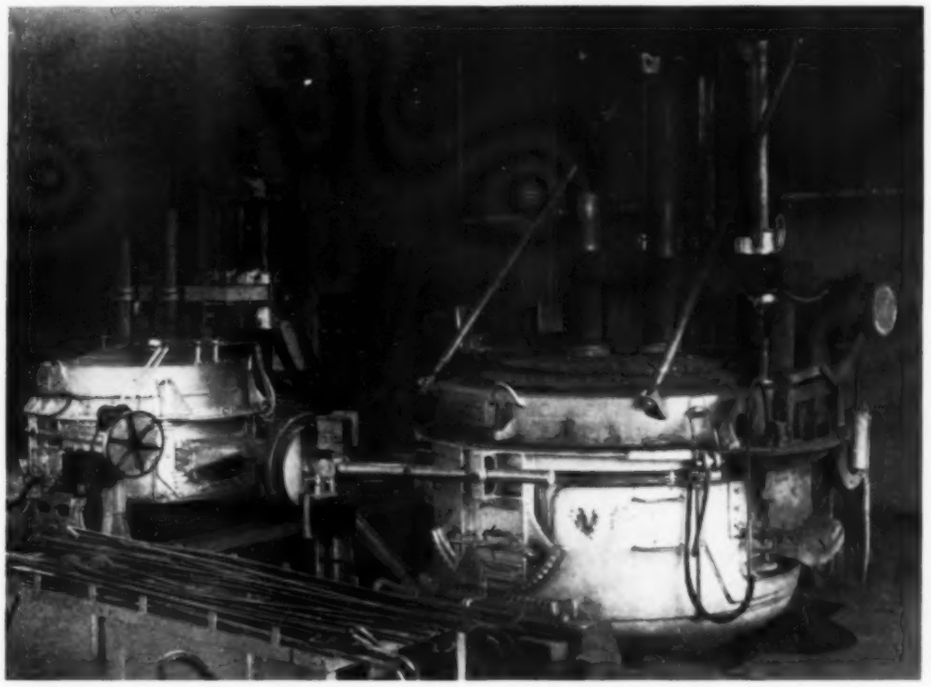
* * *

Index of foundry equipment orders, according to a report of the Foundry Equipment Manufacturer's association, Cleveland, was 173.8 in October, 1936, as compared with 161.0 in September this year and 140.0 in October last year. Index of shipments was 162.9 in October this year, 150.5 in September and 119.7 in October, 1935.

(Concluded on page 98)

RAW MATERIAL PRICES
Dec. 7, 1936

Iron	
No. 2 foundry, Valley	$20.50
No. 2 Southern Birmingham	16.88
No. 2 foundry, Chicago	20.50
No. 2 foundry, Buffalo	20.50
Basic, Buffalo	19.50
Basic, Valley	20.00
Malleable, Chicago	20.50
Malleable, Buffalo	21.00
Charcoal iron, furnace	23.00
Coke	
Connellsville beehive premium	$5.50
Wise county beehive coke	$ 4.30 to 5.00
Detroit by-product delivered	10.70
Scrap	
Heavy melting steel, Valley	$16.75 to $17.25
Heavy melting steel, Pitts.(dlv.)	17.25 to 17.75
Heavy melting steel, Chicago	16.25 to 16.75
Stove plate, Buffalo	12.25 to 12.75
Stove plate, Chicago	9.00 to 9.50
No. 1 cast, New York	11.50 to 12.00
No. 1 cast, mchy., Chicago	14.00 to 14.50
No. 1 cast, Pittsburgh	16.50 to 17.00
No. 1 cast, Philadelphia	16.00 to 16.50
No. 1 cast, Birmingham	11.50 to 12.50
Car wheels, iron, Pittsburgh	17.50 to 18.00
Car wheels, iron, Chicago	17.00 to 17.50
Railroad malleable, Chicago	18.50 to 19.00
Malleable, Buffalo	17.00 to 18.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	10.12½
Straits tin	50.75
Aluminum, 99 per cent	19.00 to 21.00
Aluminum, No. 12 (Secondary, standard)	16.75 to 17.25
Lead, New York	5.20
Antimony, New York	12.75
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	5.05



View showing new swing roof quick top charge type LECTROMELT furnace (right) arranged to tap into the same pit as a smaller door charge type LECTROMELT furnace. Castings weighing over ten tons can be poured by tapping both furnaces at the same time.

PITTSBURGH LECTROMELT FURNACE CORP.

Foot of 32nd Street, Pittsburgh, Pa.

ELECTRIC MELTING, REFINING AND SMELTING FURNACES—STANDARD SIZES 25 POUNDS TO 50 TONS

IT'S *Easy!*

ASK any molder . . . nothing could be simpler, more convenient than the use of WOOD'S Peerless Flasks. *They make every move count!*

As shown above, the operator grips the pin brackets on drag preparatory to lifting the complete flask off the mold.

It will be observed that the molder's thumb has depressed the sand strip lever and by so doing the sand strips have been withdrawn from sand back flush with inside walls of flask.

As soon as operator removes his thumbs the positive acting spring and lever arrangement automatically causes the sand strips to assume their proper positions to hold sand in flask.

Obviously, there is no wasted time or lost effort . . . production is speeded (without penalty of increased labor costs) wherever Peerless Tapered Slip Flasks are used.

Made of Aluminum or Cherry Wood, their many exclusive features are fully described in our catalog. Send for your copy today

T. B. WOOD'S SONS CO.

CHAMBERSBURG, PA.

50 Church St., New York City 387-391 Atlantic Ave., Boston

MEMBER: The Mechanical Power Engineering Associates

ROYALITE

A NEW DEVELOPMENT

By the Oldest Maker of Grinding Wheels

(A U. S. Subsidiary built the first one in 1865)

By establishing new performance records on rough grinding — by speeding up the removal of excess metal, the new ROYALITE High Speed Wheels are helping steel and malleable iron foundries to reduce costs on snagging operations.

United States Rubber Company

United States Rubber Products, Inc., New York, N. Y.

(*Concluded from page* 96)

Center Foundy & Machine Co., Wheeling, W. Va., has permit for construction of a $17,000 addition to its plant at Warwood.

♦ ♦ ♦

McCallum-Hatch Bronze Co. Inc., 242 Fourth street, Buffalo, has relocated its office and constructed a new laboratory in the main plant.

♦ ♦ ♦

Pittsburgh Metal Pattern Co. has moved to a new location at 1733 El Paso street, Morningside district, Pittsburgh. Harry F. Holthaus is proprietor of the firm.

♦ ♦ ♦

Symington Co. has changed its corporate name to the Symington-Gould Corp., and has acquired the entire capital stock of the Gould Coupler Corp. No change is contemplated in the policies, management or business operations of either company.

♦ ♦ ♦

Turner Brass Works, Sycamore, Ill., has acquired a 102 x 143-foot brick building adjacent to its main plant and has re-equipped it for office space and product development laboratories at a cost of more than $40,000. Display rooms also are being constructed. The building, of one-story brick construction, has 15,000 square feet of floor space. John Slezak is vice president of the company.

♦ ♦ ♦

A new foundry has been opened in Holland, Mich. The concern will be housed in the building formerly owned by the Western Foundry Co., and will be headed by James G. Garrard, formerly affiliated with the Western Michigan Steel Foundry, Muskegon, Mich. He is associated with his son, Arthur J. Garrard, and J. Frank Duffy of the Duffy Mfg. Co., Holland.

♦ ♦ ♦

Production of steel castings continued to increase during October, according to reports received by the industrial research department of the University of Pennsylvania from foundries operating in the Philadelphia federal reserve district. Total output in that month was the largest since March, 1930, and was 8 per cent above the average monthly production of 1926. In contrast, the output of gray iron castings declined during the month. Shipments of both iron and steel castings declined during the month, deliveries failing to keep pace with production.

NEW TRADE PUBLICATIONS

ALUMINUM FINISHES — Aluminum Co. of America, Pittsburgh, recently has published a 60-page booklet entitled "Finishes for Aluminum." The booklet is divided into seven sections which include characteristics of aluminum, mechanical finishes, chemical dip finishes, electrolytic oxide finishes, electro plating on aluminum, alclad products and paint, lacquer and enamel finishes. The section on mechanical finishes gives information on polishing, coloring, high-tighted finish, scratch-brushing, satin finish, sandblasting and tumbling and burnishing. The section on chemical dip finishes describes frosted dip, reflector dip, etching and chemical oxide finishes. The electrolytic oxide finishes includes the information on the "Alumilite" process, the "Alzac" process and anodic finishes in chromic acid. Electroplating on aluminum includes data on zinc, chromium, nickel and other metal plating. The final section on paint, lacquer and enamel finishes describes a wide variety of effects which may be obtained by those methods of coating.

OVENS—Despatch Oven Co., Minneapolis, has issued folders on its line of finish baking and drying ovens for various processes.

ODOR ADSORBERS—Consolidated Air Conditioning Corp., New York, has issued information on its line of activated coconut shell carbon odor adsorbers for application to air conditioning units.

ALLOY CASTINGS—American Manganese Steel Co., Chicago, lists representative applications for its alloy castings and gives numerous illustrations in attractive form in a recent publication.

TESTING EQUIPMENT — Harry W. Dietert Co., Detroit, has issued a comprehensive booklet on its sand testing equipment. Reference is made to sand testing and foundry control material and valuable sand data.

FURNACE CONSTRUCTION — George P. Reintjes Co., Kansas City, Mo., has issued a bulletin describing the advantages of its standardized furnace wall construction. Air leakage, support, heat loss, expansion, strength, size and encasements are a few of the problems discussed.

MATERIALS HANDLED — American Engineering Co., Philadelphia, lists information and data on its line of hoists of various types in an attractive bulletin. Capacities, hoisting speeds, types of suspension, etc., are presented.

REDUCTION UNITS—Abart Gear & Machine Co., Chicago, has described its line of spur gear, straight line drive, speed reducers in a recent publication. Specifications and details are brought out distinctly by diagrams and listings.

TOOLS—Bonney Forge & Tool Works, Allentown, Pa., presents a description of its tool sets, socket and wrench sets, bench and special tools, etc., in a recent publication. A page of handy miscellaneous tools is featured.

DUST FILTERS—Whiting Corp., Harvey, Ill., describes and illustrates the tube type dust filter manufactured by the company, in a recent bulletin. Advantages are given and a data sheet enclosed lists specific questions to be considered in installation.

FIRE CLAY—Illinois Clay Products Co., Joliet, Ill., has issued data on its line of fire clay and high temperature insulation products in a recent booklet. Crushed fire clay, standard fire clay, steel foundry clay, flour, brick, cement, coating, granules, etc., are described.

MAGNETIC EQUIPMENT—Electromagnets Ltd., 48 High street, Erdington, Birmingham, England, describes its line of electro magnetic equipment by numerous illustrations placed in folder form. Pulleys, separators, scrap sorters, chutes, shakers, etc., are included.

CRANES—Cleveland Crane Co., Wickliffe, O., relates information on the origin of the all-welded crane and data on bridges and girders, end trucks, trolleys, brakes, motors and controllers, cages, etc., in a well illustrated booklet on the company's products.

NICKEL ALLOY STEEL—International Nickel Co. Inc., New York, has issued a bulletin on the automotive uses of nickel alloy steels with specific reference to steering parts, connecting rods and bolts, spring clips, shafting, gears, pins, piston struts, valves, frames and crankshafts.

INSULATING MATERIALS — Johns-Manville, New York, in a booklet entitled "Barriers to Industrial Waste," describes its line of insulating materials furnished from various basic mineral products. Insulating sheets, bricks, blocks and blankets, cements, fillers and finishes, papers and felts, as well as a light-weight aggregate for making insulating concrete, are a few of the company's products covered.

POWER-FACTOR — General Electric Co., Schenectady, N. Y., has issued information on its complete line of capaci-

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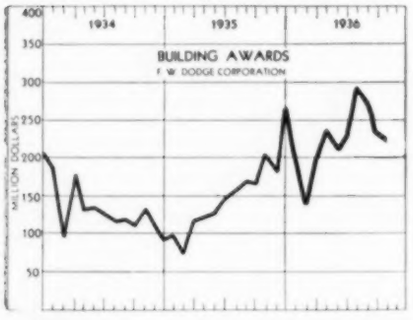

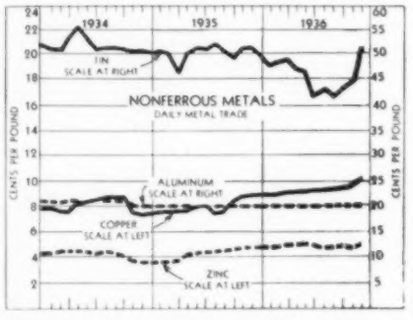

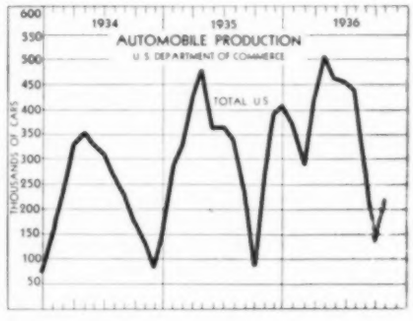

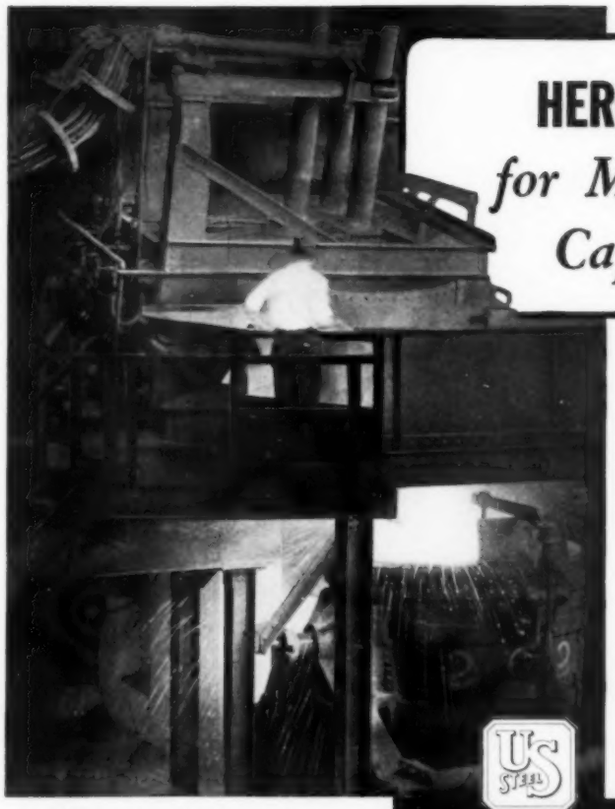

TYPE 5 *Heroult Electric Furnace shown pouring has new removable roof which simplifies and speeds up charging.*

HEROULT ELECTRIC FURNACE

for Melting and Refining . . .
Capacities up to 100 Tons

THE efficiency of the Heroult Electric Furnace as a melting and refining unit for any kind of ferrous metal . . . (alloy and tool steels, iron and steel castings) . . . has won for it berths in nearly 100 mills and foundries. Either basic or acid process, any capacity from ½ ton to 100 tons; any type of charging . . . removable roof, chute, hand or machine. Call on us for regular or special designs.

AMERICAN BRIDGE COMPANY

General Offices: Frick Building, Pittsburgh, Pa.

Baltimore Boston Chicago Cincinnati Cleveland Denver Detroit Duluth Minneapolis New York Philadelphia St. Louis

Pacific Coast Distributors: Columbia Steel Company, San Francisco
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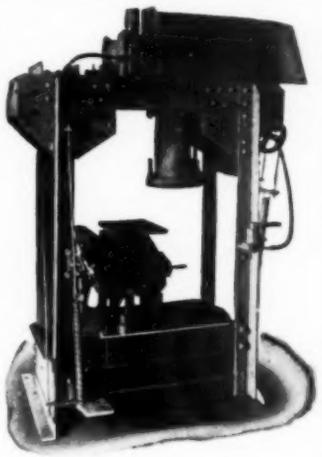
Subsidiaries of the United States Steel Corporation

UNITED STATES STEEL

Auto Malleables
Plumbing Goods
Stove Burners
Manifolds
Pipe Fittings
Vacuum Cleaners
Condulets
Carburetors
Specialties



Cores for the above castings are being made universally on our machines, resulting in greatly increased production and better cores.

We have a machine for your job.

Your Correspondence Solicited

Wm. Demmler & Bros.
Kewanee, Illinois

Known Quality

Buffalo riddles stand as a byword for quality in the foundry today because most foundrymen are familiar with Buffalo wire products from actual use on the floor.

They know a Buffalo will do a faster cleaner riddling job—and do it longer because it is made to withstand the severe service encountered only in the foundry.

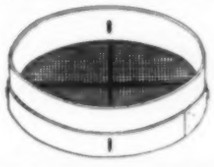
Three stock sizes: 16", 18", and 20" in diameter with mesh of either steel, galvanized, or brass wire cloth, supported by two, three, or four cross wires as specified. Specials to order. Also gyratory riddle bottoms. Write for complete information and prices.

Our complete line is made up to the highest possible standard.

Catalog No. 10CJ upon request.

We can supply any type of wire goods to meet any requirement you may have in your foundry, or out of it.

BUFFALO WIRE WORKS CO., INC.
425 Terrace, Buffalo, New York
Branch Office & Warehouse: 11 South 7th St., Philadelphia, Pa.



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tors, giving reasons for installation, benefits and illustrations of installations, showing improvement by reduction in power cost.

HANDLING EQUIPMENT — Barrett-Cravens Co., Chicago, recently has published a large catalog on material handling equipment. Containing 124 pages, including 385 illustrations, the booklet covers the application of the company's line of lift-trucks and floor-to-floor elevators.

PYROMETERS—C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., describes its line of pyrometers for high speed photoelectric action, in a recent catalog. Exclusive features, description of design, specifications and a listing of the various controlling and recording instruments produced by the company is a part of this booklet.

VENTILATION—Swartwout Co., Cleveland, has published a nontechnical bulletin on general building ventilation. The material points out six reasons for ventilating buildings, selection of ventilators, method of ventilating and features of the company's line. Typical installations are illustrated.

GEARS—Ohio Gear Co., Cleveland, describes its complete line of spur, bevel, worm and other types of gears in a new 128-page catalog. The publication supplies useful technical data on gearing, standard heat treatment methods and other facts.

CUPOLA CONTROL GAGE—Edwin S. Carman Inc., Cleveland, has published a booklet on its cupola control gage. It is stated that, after engineers have analyzed the particular melting operation in the plant, it requires only two minutes per day to set the gage to compensate for atmospheric conditions.

PUMPS—Fairbanks, Morse & Co., Chicago, has issued information concerning its line of units for general pumping service with capacities up to 900 gallons per minute and heads up to 260 feet. Description is given of application, design and operation.

BELT DRIVES—Rockwood Mfg. Co., Indianapolis, has sent out data on its single-groove, V-belt drives for industrial equipment in one of its latest bulletins. Various specifications for its products in fractional horsepowers are included. Description of its V-belt drives is given in another booklet.

POWER CONTROL — Link-Belt Co., Chicago, sets forth the advantages of its new power control having short, fast, easy-throw levers in an attractive folder. A chart shows how the element of operator fatigue materially reduces the handling efficiency of the controlled machine.

CHAINS—Morse Chain Co., Ithaca, N. Y., has published a stock booklet on its line of silent chain drives, couplings, roller chains, sprockets, etc. Miscellaneous data on silent chain drives, features of standard couplings, selection, capacities, and other information on the products is given.

ELECTRIC FURNACES—Ajax Electrothermic Corp., division of the Ajax Metal Co., Trenton, N. J., has issued a bulletin on its laboratory type electric furnaces, presenting their field of use, general information, principles of operation and a detailed analysis and description of the various types made by the company.

FIRE CONTROL—Garrison Engineering Corp., Great Barrington, Mass., has sent out information concerning the proper action to take in case of fire and has introduced its new "dry" method of fighting fire. Using an unusual question and answer type of publication, the company effectively explains causes for fires and gives advantages of its fire fighting equipment at the same time.

DUST COUNTER—Bausch & Lomb Optical Co., Rochester, N. Y., has published a booklet on its newly-developed dust counter for aid in attaining further knowledge of dust conditions. The unit consists of an air sampling device and a dark field microscope viewing and counting system.

SAW SHARPENING — Norton Co., Worcester, Mass., has published a booklet on saw sharpening and knife grinding. What constitutes a good saw gumming wheel, its action, speed, feed or amount of cut taken, condition of saw, dressing, life, etc., are a few of the subjects treated. A list of recommended grades and grains concludes the booklet.

Faked Foundry Facts

A Slip Jacket

LIFT TRUCKS—Elwell-Parker Electric Co., Cleveland, describes its low lift platform trucks in a recent bulletin. These machines have a capacity of 3000 pounds and the principal units of their construction are standardized with other of the company's trucks, tractors and cranes, providing interchangeability of spare parts. The company's general line is covered briefly.

CONTROLLERS—Thermo Control Devices Inc. and Wheelco Instruments Co., both at 1112 Milwaukee avenue, Chicago, have presented folders covering their automatic flame controls, shut-offs for protecting furnaces and furnace loads from excessive heat by the radio principle and their line of small indicating pyrometers. Specifications, uses, prices, etc., are given.

CONTROL PYROMETERS — Foxboro Co., Foxboro, Mass., emphasizes the operating details, principles and methods of application of its line of potentiometer control pyrometers in a recent bulletin. Related equipment for automatic temperature control also is covered. Specifications and ranges of thermocouples, resistance bulbs and other accessories are given.

CONTROLLERS — Brown Instrument Co., Philadelphia, has published a new catalog on air operated controllers for temperature, pressure, flow and liquid level regulation. Principles of operation are explained, diagrams are included and illustrations are used. Complete descriptions of universal cases and their dimensions, valves, valve positioners, cylinders, etc., are added.

BUFFING AND FINISHING—Frederic B. Stevens Inc., Detroit, has issued an interesting booklet on buffing compositions and metal finishing equipment, including diagrams, specifications and numerous illustrations of the company's line of polishing and buffing lathes and other equipment. Detailed information on buffing compositions and rouges and their applications also is included.

FOUNDRY LADLES—Whiting Corp., Harvey, Ill., has presented information on its line of various types of ladles—helical-worm geared crane, insulated and covered, mixing, reservoir, teapot spout, bottom tap, truck and special ladles in a recent bulletin. Description of the company's new ladle with automatic forced lubrication and an automatic safety brake is included.

CENTRIFUGAL PUMPS — Worthington Pump & Machinery Corp., Harrison, N. J., describes its line of pressed steel frame mounted centrifugal pumps, ball bearing units for a wide range of uses, in a recent publication. A typical section drawing, with complete description of parts included, is presented. Also the parts going into the units are rated, described and illustrated according to use.

METAL POLISHING — Norton Co., Worcester, Mass., has presented , in an attractive fashion, its line of abrasive materials in a booklet entitled "Facts About Metal Polishing." Physical properties required in abrasive grain for polishing, aluminum oxide abrasive for polishing, preparation of glue, types and setting up of polishing wheels, drying, selection, etc., are included in the publication.

HEATERS, ENGINES, PUMPS—Worthington Pump & Machinery Corp., Harrison, N. J., has issued four bulletins: the first covers diesel engines, vertical four-cycle, direct injection type; the second deals with the company's horizontal duplex steam pump and receiver sets; the third concerns gas engines, the vertical four-cycle type, with specifications and dimensions; and the last booklet describes stationary feedwater heaters of the standard non-deaerating type.

DIE CASTINGS—Chicago Die Casting Mfg. Co., 2515 West Monroe street, Chicago, has issued its bulletin No. 36 in which are illustrated and described pulleys of various types; flexible couplings, self-aligning shaft supports, pillow blocks, collars, journal bearings, sleeve couplings, universal joints, die cast hubs, sanding disks, grinding mandrels, saw mandrels, motor attachments, grinding attachments, flanges, reducing gears, miter gears, and a novel display table with a capacity of 100 pounds.

INDUSTRIAL FURNACES—Philadelphia Drying Machinery Co., Philadelphia, has issued a group of seven booklets on its line of furnaces, ovens, etc. The first covers the box type furnace, oil or gas fired, designed for continuous operation up to 1800 degrees Fahr. The second covers forge furnaces, slot type and gas fired, designed for quick soft heats. A third describes its forge furnace, oil fired, for the same purpose. Convection heated ovens are illustrated and described in a fourth, and oil or gas fired indirect tempering furnaces furnish the fifth subject. High efficiency, low pressure industrial oil burners and the company's furnaces for melting aluminum, brass, monel, nickel and iron, oil or gas fired, complete the list.

Let's look at the

RECORD OF TRUSCON FOUNDRY FLASKS

The performance records of over 300,000 Truscon Foundry Flasks would fill a book. A few "samples" of these performance records are outlined at the right. • Truscon makes every shape, size and weight of alloy steel foundry flask and a complete line of related accessories to meet every requirement. • Write for FREE catalog of 48 pages. Check up on Truscon Foundry Flasks before you purchase your next supply.

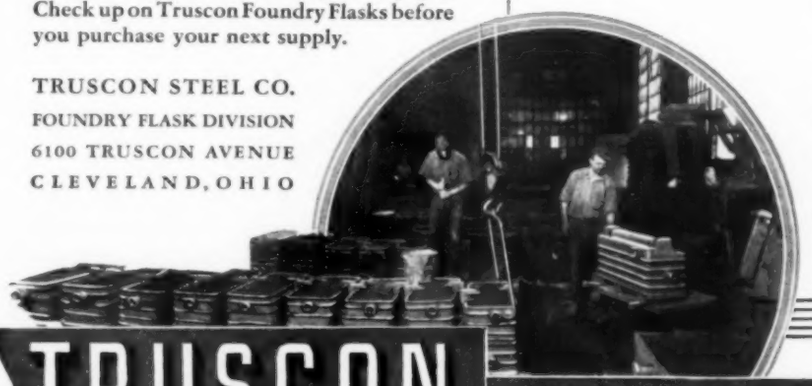
TRUSCON STEEL CO.
FOUNDRY FLASK DIVISION
6100 TRUSCON AVENUE
CLEVELAND, OHIO

FOUNDRY A—"We have produced over 6000 castings for automobile cylinders in one flask and our 2000 other Truscon Flasks have comparable records.

FOUNDRY B—"Over 5000 flywheel castings were made in each of 300 Truscon Flasks over a 4-year period.

FOUNDRY C—"We increased our production around 20% after adopting Truscon Flasks as standard equipment. Their accuracy of design, great strength and light weight save money in numerous ways."

FOUNDRY D—"Resistance grids made in our foundry demand precision in molding. Our Truscon Flasks are giving us complete satisfaction. We find that sand can be reduced to a minimum with your flasks."



TRUSCON

ALLOY STEEL FOUNDRY FLASKS

SAND TESTING

Sand Testing is measuring the
MOISTURE — PERMEABILITY
STRENGTH — FINENESS
MOLD and CORE HARDNESS
of the sand to eliminate disturbing variations in sand and to furnish measured sand to molders that is most suitable for the work.

Better Castings at Lower Cost are Made in Measured Sand.

Write for more information

Moisture Teller

Sand Rammer

Permeability Meter

Universal Sand Strength Machine Type C. P.

Harry W. Dietert Co.-676 W. Grand Blvd.-Detroit, Mich.

GOOSE LAKE

Illinois Clay Products Company

JOLIET, ILL.

Fire Clay and Fire Clay Flour

Fire Clay Brick

Therm-O-Flake Insulation

. . . That feeling of DEPENDABILITY is "worth its weight in gold"

Carried in stock by the leading Foundry Supply Jobbers.

Glutrin and Goulac Core Binders have held the fullest confidence of leading foundries for over a quarter of a century. Their remarkable uniformity has contributed to a standardized mix in the core room, assuring the same good casting results day after day and year after year.

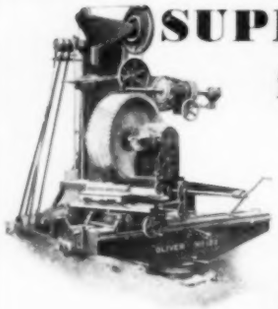
ROBESON PROCESS COMPANY

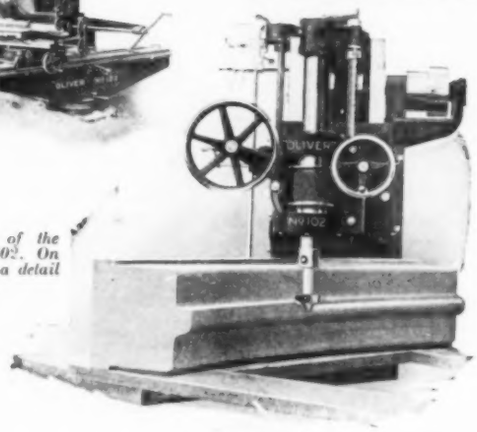
AMERICAN GUM PRODUCTS COMPANY

General Offices:
230 Park Avenue, New York City

Operating Plants:
AuSable Forks, N. Y.; Erie, Pa.

SUPREMACY— founded on SERVICE





Two views of the Oliver No. 102. On the right is a detail of the work.

Well-known is the superiority of the Oliver No. 102 Pattern Milling Machine. A list of its users would constitute an honor roll of the world's engineering firms.

The reason for its supremacy is a simple one — better service on an economical basis. For the No. 102 will cut your production time one-quarter and at the same time increase the quality of the work. You'll be interested in the many features — may we send details?

Oliver Machinery Company
Grand Rapids, Michigan, U.S.A.

USE THE CEILING FOR HANDLING

Material Handling Problems SOLVED

MODERNIZED Monorail Conveying . . . the system that stays in step with the demands of today . . . can be bought only as the product of engineering ability. Louden Engineers, pioneers in monorail, have engineered systems for the "Who's Who" of American Industry. This unusual breadth and depth of experience is supplemented by the "world's most complete line of modern monorail equipment."

For a well-thought-out and sound solution of your changing needs get in touch with a Louden engineer, either at the main office or in your nearest principal city. THE LOUDEN MACHINERY COMPANY, 845 West Avenue, Fairfield, Iowa.

LOUDEN MONORAIL

SAVE FLOORS FOR PRODUCTION

The Year Was Founded

(Over 40 years ago) we began serving a uniformly high-grade fire clay to a small list of foundries.

That small list grew. It still grows, *and it still carries today customers' names that appeared on the original list!*

We are proud of that fact, of course, but there are still a few foundries that have not yet tried West Virginia fire clay. If you are one of these, we urge you to send us your inquiry. Only a trial will prove the superiority of this product and demonstrate the promptness of our service.

Prompt shipments of mixed carloads, if desired.

- Fine Ground and Rolled Flake for Cupola and Ladle Lining and for all furnace uses.
- Specially prepared high grade pulverized Black Horse brand Fire Clay for facing, bonding and laying fire brick.

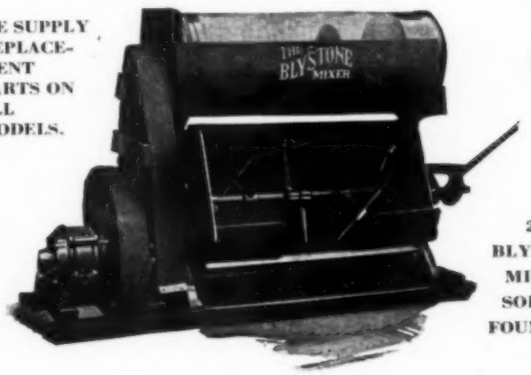
WEST VIRGINIA FIRE CLAY MANUFACTURING CO.
Diamond Bank Building
PITTSBURGH, PA.

The **NEW**
BLYSTONE MIXER
has many **IMPROVED** *features*

AND DOES NOT GRIND MATERIALS

The Foundry using the most up-to-date equipment has the best chance of meeting competition and making money. Take mixers for example. Many Foundries are using the same mixer they have had for years. Even the old Blystone, as good as it is, CANNOT COMPARE WITH THE NEW MODELS WITH MANY EXCLUSIVE BLYSTONE FEATURES. Remember, Blystone Mixers DO NOT GRIND materials. Why not install a NEW Blystone Mixer to meet 1937 competition. It will give you a better mix and reduce waste to a minimum. IT WILL SOON PAY FOR ITSELF.

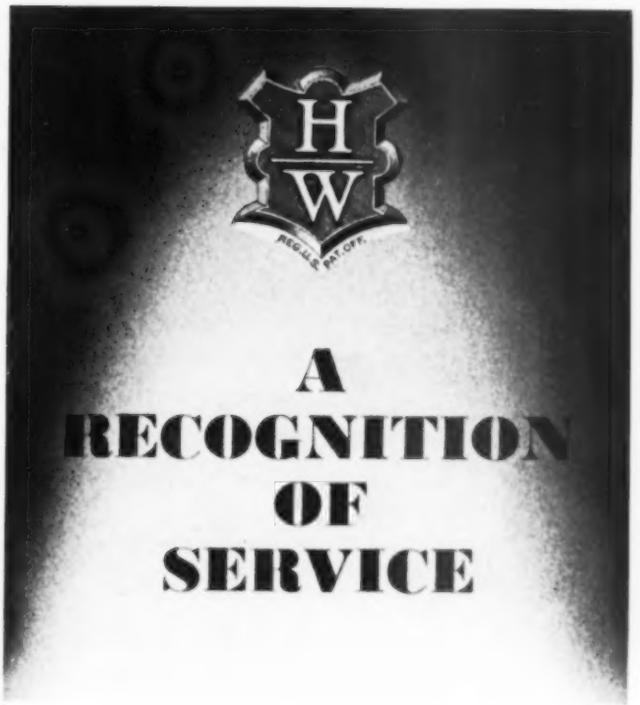
WE SUPPLY REPLACEMENT PARTS ON ALL MODELS.



2000 BLYSTONE MIXERS SOLD TO FOUNDRIES

Write for Literature

BLYSTONE MANUFACTURING CO.
1236 Grant St. Cambridge Springs, Penn.



A RECOGNITION OF SERVICE

Customers of Hickman-Williams are mighty particular about the kind of service they receive on their ferro-alloy, pig iron, coal and coke orders. Perhaps that's why they *remain* Hickman-Williams' customers.

It's a sort of unofficial *recognition of service* — this loyalty to H-W. There aren't any medals passed out or monuments erected, — just a continued stream of orders that say to us "We like your way of doing business H-W, — the quality of your products and service!"

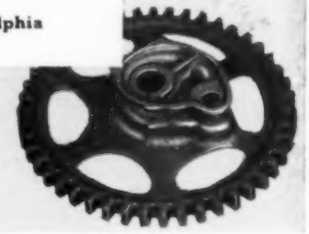
"Over 45 years of dependable service, supplying ferro-alloys, pig iron, coal and coke to the entire metal working industry."

•

Hickman, Williams & Co.
(INCORPORATED)

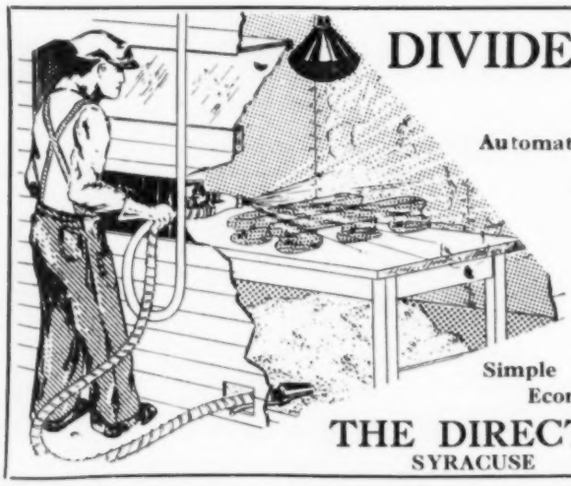
CHICAGO PHILADELPHIA CINCINNATI CLEVELAND
ST. LOUIS DETROIT NEW YORK PITTSBURGH MINNEAPOLIS

CHARGE SUPERIOR CHARCOAL IRON AND STOP CHARGING OFF SCRAP



IF you wish to avoid charging off scrap at a loss then charge Superior Pure Charcoal Pig into the cupola. ☆ 15% to 25% of Superior Pure Charcoal Iron in the mix will often reduce scrap losses by as much as 50% to 60%. ☆ Castings have higher strength . . . are more machinable. Cold shuts, mis-runs, small leaks, blow holes, pin holes, etc., are almost completely eliminated. ☆ Grey Iron, Malleable or Chill, are all benefited by use of Pure Charcoal Iron. ☆ Let our metallurgical department help you to select from the 16 grades of Superior Pure Charcoal Iron available.

SUPERIOR CHARCOAL IRON COMPANY
GRAND RAPIDS, MICHIGAN
Debevoise-Anderson Co., Inc. *Eastern Representative* • New York • Boston • Philadelphia



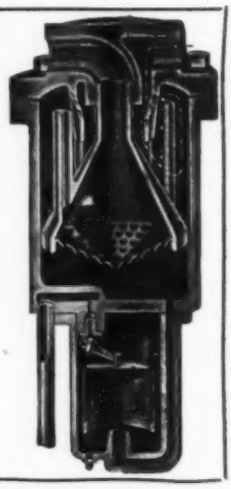
DIVIDE AIR SEPARATORS

For removing oil and water from compressed air
Automatically Drained — Very Efficient

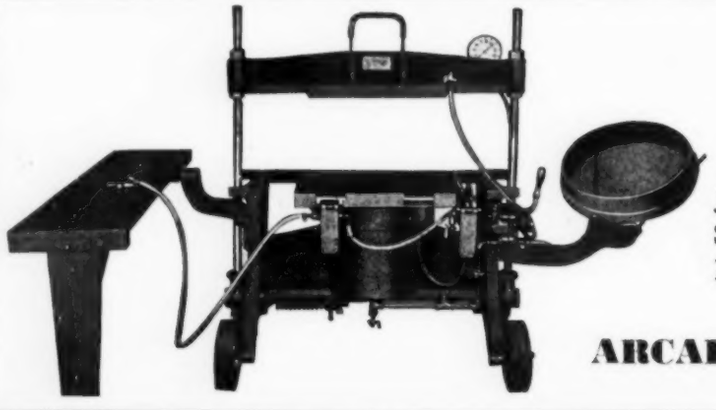
* * * *

CYCLONE BLASTERS

For cleaning Castings and Steel (use Sand, Grit or Shot)
Simple — Efficient — Inexpensive
Economical to operate — Results Guaranteed



THE DIRECT SEPARATOR CO., INC.
SYRACUSE NEW YORK



DEPENDABLE JOLT SQUEEZERS

	No. 81	No. 91	No. 101
Jolt Cyl.	3"	4"	5"
Squeeze Cyl.	8½"	10"	13"
Between Uprights	32"	36"	38"

ARCADE MANUFACTURING CO.
Freeport, Illinois

DIAMOND SAND BLAST

DIAMOND

LIKE the diamonds from which we take the brand name, Diamond Sand Blast Sand is clean, sharp, fast cutting. Ideal for all manner of sand blasting, being especially prepared for this kind of work.

Call on us to assist you in solving your sand blast problems.

Sand Blast Sand

FOR FAST CLEANING AND FINE FINISH standardize on Diamond Sand Blast Sand. It gives results that are impossible to duplicate with other forms of abrasives, and besides, it is the most economical cleaning agent you can employ.

WASHED, DRIED AND SCREENED SPECIAL SANDS FOR STEEL MOULDING, FURNACE BOTTOMS, CORES, OPENERS,—AND SILICA FLOUR

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on your Core Oven soon pays for itself.

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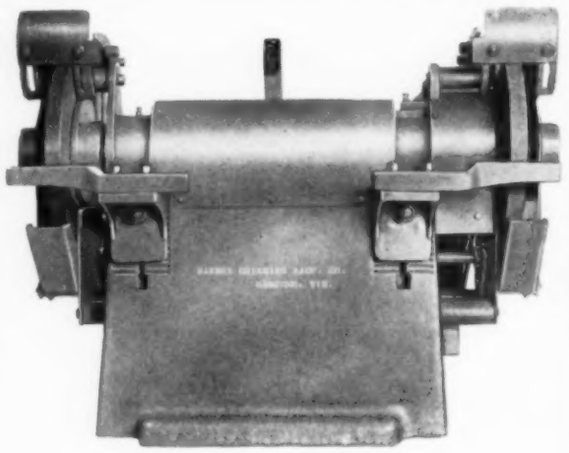

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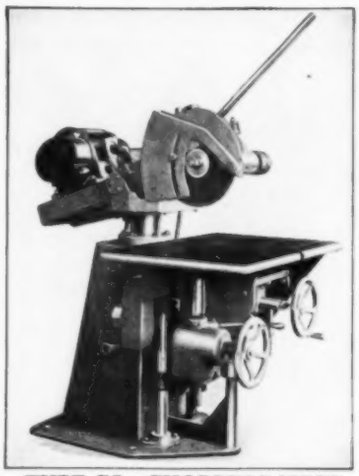

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ITS SPEED AND ADAPTABILITY ENTIRELY REMOVE THE CUTTING PROBLEM

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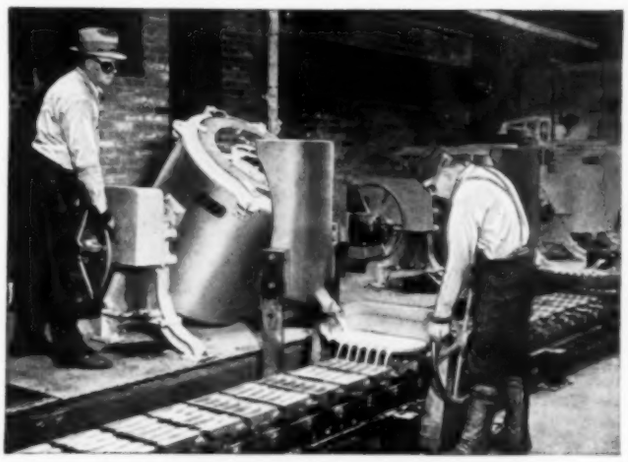

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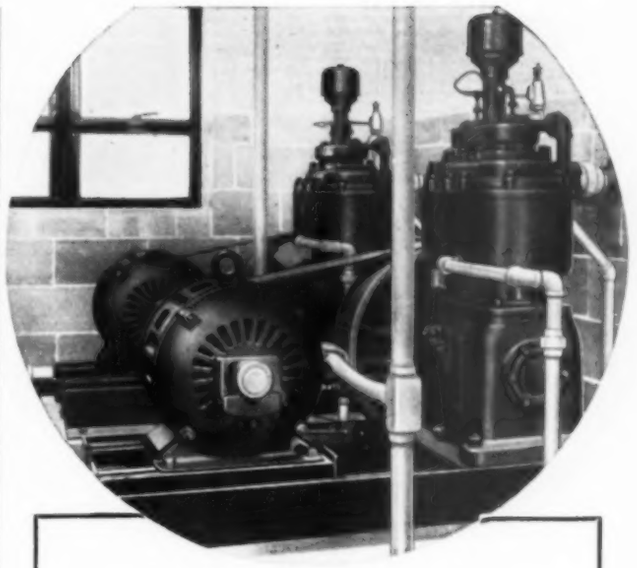
**The Conveyor System shown is a Link Belt Installation.*



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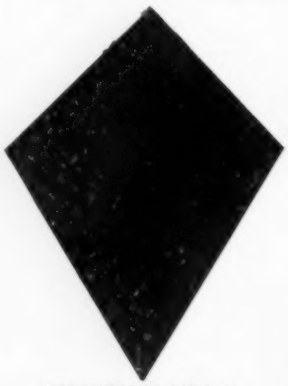
FACE ALSO THESE FACTS



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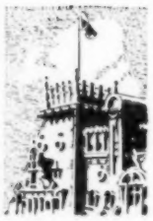

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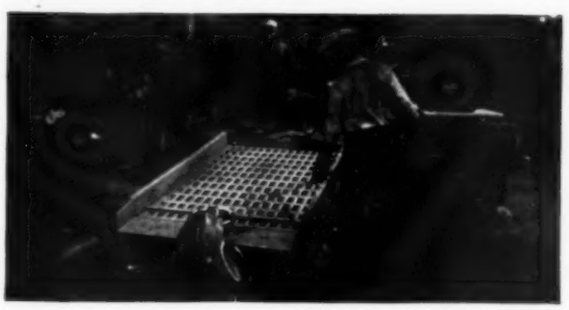

4' x 6' Shake-out handling 10,500 flasks daily

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No—we're not really in the insurance game—although BUFFALO BRAND VENT WAX is practically an insurance policy against poor core performance!

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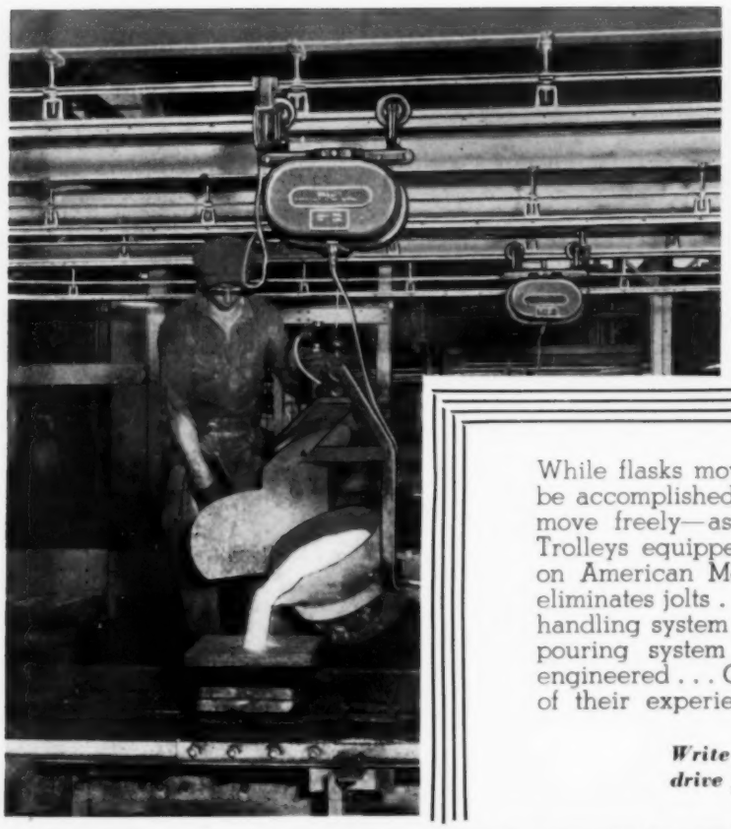
Now is the time to ask your dealer or write us for a free sample!

UNITED COMPOUND COMPANY

BUFFALO



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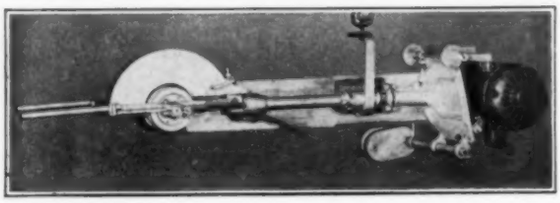

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Multiple V-Belt

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THIS second edition contains the most complete collection of formulas, tables, weights, specifications and information relating to foundry practice ever gathered together.

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Eighteen years foreman on gray iron, heavy or light, jobbing and production castings. Can rig and produce. Good handler of men. Best references. Position in New Jersey preferable. Address Box 772, THE FOUNDRY, Cleveland.

GRAY IRON SUPERINTENDENT

Efficient, up to the minute in all modern methods of foundry practice. Practical in coremaking, molding, cupola practice and patternmaking; expert rigger for high production at minimum cost. Can handle all classes of help successfully. 15 years executive. Age 44. Married. Address Box 234, THE FOUNDRY, Cleveland.

BRASS FOUNDRY FOREMAN

wishes to get connected. Thorough experience jobbing or production. Know mixes, melting, molding. Salary a second consideration. Address Box 750, THE FOUNDRY, CLEVELAND.

IRON FOUNDRY FOREMAN

Successful jobbing or production. Twenty years experience, maximum production, minimum scrap; maintain schedules; McLain graduate; handle core end. Moderate salary. Address Box 775, THE FOUNDRY, Cleveland.

COREROOM FOREMAN

Practical, energetic, successful coreroom foreman with twenty years experience iron, steel, brass, jobbing or production. Open for engagement. Reasonable salary. Address Box 776, THE FOUNDRY, Cleveland.

FOREMAN OR ASSISTANT

Desires position. Ten years experience in large production foundry as molder on small gray iron castings. Experienced on conveyors and continuous pouring. Six months as foreman. Age 35. Address Box 763, THE FOUNDRY, Cleveland.

CORE FOREMAN

Light, medium gray iron, malleable. Employed, desire change. Twenty years experience. Fourteen years same company. Also experienced in girls' corerooms. References. Address Box 744, THE FOUNDRY, Cleveland.

MALLEABLE FOUNDRY FOREMAN

desires connection. Fifteen years experience in furnace and cupola malleable, also gray iron. Jobbing and production. McLain graduate. Address Box 757, THE FOUNDRY, Cleveland.

FOUNDRY SUPERINTENDENT

Progressive young foundryman, 20 years practical experience producing high grade machinery and Diesel engine castings, light, medium and heavy, gray iron, semi-steel and alloyed irons to meet rigid specifications. Excellent references. Address Box 773, THE FOUNDRY, Cleveland.

PRACTICAL FOUNDRYMAN

With 25 years experience as superintendent and manager of foundries making medium and heavy gray iron and semi-steel castings; also nickel and chrome alloys and mehanite, desires to locate with a reliable foundry. Address Box 770, THE FOUNDRY, Cleveland.

SALESMAN

FOUNDRY SUPPLIES—EQUIPMENT

Twenty years experience. Twelve years specializing dry and liquid binders. Pacific Coast or Central. $250 and expenses. Address Box 766, THE FOUNDRY, Cleveland.

PRACTICAL COREROOM FOREMAN

Thoroughly experienced to take full charge of coremaking department in light gray iron production line. Now employed but desire change. Available upon reasonably short notice. Address Box 735. THE FOUNDRY, Cleveland.

STEEL FOUNDRYMAN

Desires position as foundry foreman or assistant. More than 15 years foreman. Can handle any department. A-1 references. Address Box 771, THE FOUNDRY, Cleveland.

Opportunities

A REAL OPPORTUNITY

For an aggressive foundry executive or salesman who has a specialty product or idea of merit and needs foundry facilities for manufacturing; or will make outright sale of a large equipped plant and gray iron foundry at a very interesting price. Plant is located in west-central Ohio. Excellent shipping facilities, skilled labor immediately available. Write at once. NEON PRODUCTS, INC., LIMA, OHIO.

FOUNDRY SALES REPRESENTATIVE

SUCCESSFUL FOUNDRY SALES REPRESENTATIVE COVERING NEW YORK DISTRICT, WANTS ADDITIONAL HIGH GRADE GRAY IRON FOUNDRY SPECIALIZING ON LIGHT CASTINGS. MOTOR TRUCK DELIVERY ESSENTIAL. COMMISSION BASIS. ADDRESS BOX 743, THE FOUNDRY, CLEVELAND.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, THE FOUNDRY, Cleveland.

WANTED

One good used electric truck for charging annealing ovens. State price, condition, etc. Address Box 733, THE FOUNDRY, Cleveland.

WANTED-TO-BUY

Following used equipment in good operating condition:
500 and 1000-lb. Electric Furnaces for cast iron swing wheel grinders—12-inch x 2-inch wheel. Write prices and description to KELLY FOUNDRY & MACHINE COMPANY, BOX 570, ELKINS, WEST VA.

WANTED

One oil fired alloy furnace, small. One Detroit Electric Furnace of small capacity and fixtures. Equipment must be in good condition. WINONA MACHINE & FOUNDRY COMPANY, WINONA, MINNESOTA.

WANTED-TO-BUY

Two hydraulic pressure moulding machines; squeeze and flask lift style suitable for 24-inch round flask. European make preferred. Address Box 762, THE FOUNDRY, Cleveland.

WANTED-TO-BUY

Small direct arc Heroult type furnace, 100-lb. to 250-lb. charge, with or without electrical equipment. Address Box 753, THE FOUNDRY, Cleveland.

WANTED

Electric furnace for steel melting, capacity approximately 1½ tons. Address Box 749, THE FOUNDRY, Cleveland.

WANTED

One (1) five or six ton steel ladle. Advise best price delivered McKeesport, Pa. FORT PITT STEEL CASTING COMPANY.

WANTED-TO-LEASE

Gray iron or malleable foundry in the middle west. Prefer one for small work and having molding machines with 20 or more floors. State particulars, size, location, rent, etc. Address Box 748, THE FOUNDRY, Cleveland.

FOR SALE OR LEASE

Large, complete gray iron foundry with modern cupolas, blowers, etc. Ideally located in west-central Ohio. Railroad siding to building. Municipally owned low power and light rates available. Low tax rates. Skilled foundry workers immediately available. Priced to immediately lease or sell. Write for full details at once.

NEON PRODUCTS, INC.
LIMA, OHIO

FOUNDRY FOR SALE

Pattern shop in connection; doing gray iron, semi-steel and brass jobbing work. Located in mining and lumbering district. Owner selling account of health. For full particulars write PACIFIC GRAPHITE WORKS, OAKLAND, CALIFORNIA.

FOR SALE OR LEASE

Iron foundry completely equipped. Located northeastern Ohio. Ready for immediate production of small and large castings up to ten tons. Present owners require castings which would assure purchaser of immediate tonnage. ADDRESS W. J. BECKLEY, 111 EAST MAIN STREET, RAVENNA, OHIO.

FOR SALE

American Tumblast, compressed air type 36 x 42 in good operating condition. Can be rebuilt into the Wheelabrator design at moderate cost. $600.

American Pressure type sandblast barrel, 42-inch diameter, 36-inch wide, complete with tank and fittings. $200.

American No. 1 Gravity Sandblast Barrel, 20-inch diameter 34-inch wide. Perfect operating condition. $400. Address Box 764. THE FOUNDRY, Cleveland.

MOLDING MACHINES

1 Osborn No. 404 jolt roll-over pattern draw 40 x 54"—15" draw 1500 lb cap @ 80 lb. press. with run-out Mold Car.
1 International Type "F" 30 x 12" draw jar ramming power turn-over power draw, 1800 lb. capacity @ 80 lbs. pressure.
1 Pridmore Style "V" rock-over drop with air roll-over and pattern draw, table 31 x 40"—2000 lb. cap. @ 80 lb. pressure.
1 International Type "G" heavy duty type, portable, jar ramming power turn-over and foot draw, 1000 lb. cap. @ 80 lbs. pressure, for flasks up to 24" width 10" draw.
1 International Type "G" portable for flasks up to 20" outside width 8" pattern draw—450 lbs. cap. @ 80 lbs. pressure.
2 Grimes Model K-614 air roll-over 6" cyl. 1000 lbs. cap. @ 80 lbs. pressure max. width of flask 32" max. length O/A 48" —14" draw.
1 Arcade No. 11 air operated squeeze roll-over draw, portable, table takes pattern plates up to 14 x 20"—length of pattern table 34"—7" lift.
1 International Type "JL" air jarring machine, 40 x 66" table 12" cyl. 12" lift 5500 lbs. lifting cap. @ 80 lbs. pressure.

MISCELLANEOUS

1 No. "O" Simpson Mixer 3 ft. dia. Pan single muller-pulley drive.
1 New Haven Sand Blast Barrel Model "A" self-contained, 36" dia. x 46" long.
1 Beardsley & Piper stationary type 10 ft. Sandslinger equipped with AC Motor.
1 No. 4-B U S Smelting Furnace 2000 lbs. cap. equipped with oil burners—motor for tilting.
1 36" dia. x 68" long x ⅜" plate Sly Tumbler, equipped with T & L pulley.
1 1-ton American Eng. (LoHed) Hoist equipped with AC Motor, floor operated, 20 ft. lift, speed 20 FPM—with plain trolley.
1 Roots No. 5 horizontal positive pressure Blower 13 ft. displ. 16" dia. top discharge, geared drive with shaft extension.

We carry a large and COMPLETE STOCK of foundry equipment bargains for quick delivery—advise as to your requirements.

SCULLY-JONES & COMPANY
19th & Rockwell Sts. Chicago, Ill.

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